ERIEZ

GLOBAL LEADER IN SEPARATION TECHNOLOGIES

Installation, Operation & Maintenance Instructions

PRECISIONGUARD X8-SF METAL DETECTOR REFERENCE GUIDE

ERIEZ

TABLE OF CONTENTS

CAUTION

Use this product only in the manner described in this manual. If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

CAUTION

The metal detector is heavy. Do not lift nor support the metal detector by hand/manually. To avoid damage or injury, use only the handling and installation procedures outlined in this reference guide.

WARNING - HAZARDOUS VOLTAGE

Hazardous voltages are present in this equipment when energised. All power sources must be isolated or disconnected before accessing the inside of the enclosure. **Failure to follow these precautions may result in serious injury or death.**

CAUTION

If you have a pacemaker or other implanted medical device, please consult your doctor before using this product. Electromagnetic waves can interfere with the operation of your pacemaker or other medical devices.

CAUTION

Metal detectors emit electromagnetic fields, which may interfere with some pacemakers or other implanted medical devices. The end user bears the responsibility to determine if the emitted electromagnetic fields will affect employees with medical devices. If you have an implanted medical device, please consult your doctor before being in the vicinity of the metal detector during operation.

CAUTION

For continued compliance with electrical safety standards, the protective earth connection from the power source must be connected directly to the protective terminal on the wall of the enclosure. This is required to be the FIRST connection to the terminal, and secured with a star lock washer and nut, independent of any other connections to the terminal.

CAUTION

To avoid injury or damage to the equipment, only qualified service technicians are to install the metal detector at customer sites in accordance with local safety codes.

CAUTION

To avoid injury or damage to the equipment, all electrical installations are to be performed by qualified and competent personnel authorised by Eriez Manufacturing Company. All electrical installations are to be in compliance with local safety codes. Ensure that all materials used in the installation of the equipment are suitable and appropriate for purpose.

CAUTION

An external disconnect switch labeled “Metal Detector” must be installed near the metal detector to allow the metal detector to be completely disconnected from the power source during installation and maintenance. All lock-out tag-out procedures and local safety codes are to be followed during metal detector installation and maintenance. The metal detector must not be positioned in a way that makes it difficult to operate the disconnect switch.

CAUTION

To avoid injury or damage to the equipment, all electrical maintenance on the metal detector is to be performed by qualified and competent service technicians authorised by Eriez Manufacturing Company.

CAUTION

The X8-SF Metal Detector is not designed nor intended for operation in environments classified as hazardous locations/zones. Do not operate the X8-SF Metal Detector in areas where the possibility of explosions or fires exists.

CAUTION

Cleaning procedures may cause false trips of the metal detector, resulting in actuation of any connected reject devices. Ensure personnel and equipment are clear from the path of the reject devices at all times. To avoid an unsafe condition or damage to equipment, remove all power sources (including air supplies) from the metal detector and reject devices prior to washdown.

CAUTION

For installations where the metal detector control screen presents ergonomic challenges or unsafe viewing conditions, it is recommended that a remote display be used to eliminate these issues.

CAUTION

The metal detector will start automatically when power is restored after a power interruption. All external components controlled by relays within the metal detector control will also complete their cycle when the metal detector is re-energised. The end user must determine if a hazard exists and install the proper safety precautions and protocol to ensure that an injury does not occur in the event of a power interruption.

CAUTION

When cleaning the metal detector surfaces, use appropriate personal protective equipment (PPE) for any physical/chemical/biological hazards that may exist due to the end user's production environment. Avoid contact with contaminants on or around the metal detector. Pressure wash and sanitise metal detector surfaces when maintenance is required.

EXPLANATION OF SYMBOLS

Cautionary Information

Protective Conductor Terminal

Hazardous Voltage – Risk of Electric Shock

Pacemaker Warning Information

Pinch Point

HANDLING

RF INTERFERENCE

Radio Frequency (RF) emissions have been tested to the requirements of FCC 47CFR Part 15B, FCC 47CFR Part 18, and CISPR 11/EN 55011 (Class A, Group 1). The Eriez PrecisionGuard X8-SF Metal Detector generates an electromagnetic field, which has the potential to escape. This field may interfere with nearby radio frequency equipment.

If interference becomes a problem, you may need to:

1. Move the Metal Detector or interfering equipment
2. Change the frequency on the Metal Detector
3. Call the Factory for further assistance

HANDLING INSTRUCTIONS

DO NOT LIFT THE METAL DETECTOR BY INSERTING ANYTHING INTO OR THROUGH THE TUNNEL.

The inner surface of the tunnel protects the precisely tuned electronic circuit and internal parts. The tunnel liner also protects the internal parts against water damage. The integrity of this liner and seal must be maintained. Any damage or distortion to this surface caused by handling will invalidate the warranty.

When handling, keep the metal detector on the shipping pallet as long as possible.

WHEN REMOVING THE DETECTOR FROM THE SHIPPING PALLET, LIFT ONLY ON THE DETECTOR HOUSING SURFACES OR SUPPORTING FEET. DO NOT LIFT BY THE CONTROL HOUSING THAT PROTRUDES FROM THE BODY OF THE METAL DETECTOR.

If possible, lift the metal detector by using a crane and soft nylon slings running under the entire metal detector housing as seen below.

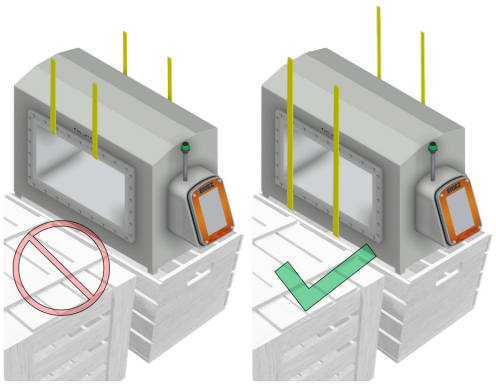


Figure 1: Metal detector handling instructions

Larger metal detectors may have eyebolts preinstalled at the factory. When handling with the eyebolts ensure loads are never applied perpendicular to the shank of the eyebolts; they will break.

CAUTION

The metal detector is heavy. Do not lift nor support the metal detector by hand. To avoid damage or injury, use only the handling and installation procedures outlined in this reference guide.

Never weld any attachment to the metal detector. Do not attempt to drill and/or tap the metal detector for lifting or mounting attachments.

SPECIFICATIONS

EQUIPMENT DESCRIPTION

The Eriez PrecisionGuard X8-SF Metal Detector is a balanced coil metal detector used to detect metal contaminants/ foreign objects in material(s) passed through the aperture.

SUPPLY, MAINS, VOLTAGE

The X8-SF Metal Detector will operate from AC supply voltages over the range of 100 to 240 VAC RMS, 50 or 60 Hz. Mains supply voltage fluctuations shall not exceed ±10% of the nominal value.

EQUIPMENT CLASSIFICATION

The X8-SF Metal Detector is specified for the following categories:
Class 1 equipment requiring a protective ground conductor.
Installation Category (Overvoltage Classification) II
Pollution Degree 2

MAXIMUM DEMAND

The internal electronics require 60 VA to operate. The power available for external loads (powered from the internal source) is 1250 VA and is limited to 5 amps of current by CB2. Maximum demand will be 1310 VA.

OUTPUTS

There are nine total outputs, each with one set of contacts. There are four programmable “Form C” (NO-C-NC) relay outputs rated at 5 A (due to PCB trace width) up to 250 VAC, 30 VDC each.

- Reject (K1)
- Relay 1 (K3)
- Relay 2 (K2)
- Relay 3 (K4)

All four relays are fail-safe wired; if power is lost, the relays will switch to the activated position.

NOTE: If the power at L1B and L2B is used to power the relays, its maximum available current is 5 A, and the voltage will be equal to that applied at L1 and L2 on TB3.

Power at L1B and L2B passes through the circuit breaker switch located on the left side of the control housing. There are five programmable “Form A” (SPST-NO) solid state relay outputs rated at 500mA up to 40 VDC.

- Out 1 (K9)
- Out 2 (K8)
- Out 3 (K7)
- Out 4 (K6)
- Out 5 (K5)

These five outputs can be wired as NPN or PNP. The output can be set to NO or NC under normal running conditions.

REJECT

Reject (K1) is the primary reject device output. It must run via Reject Timer or Overhead A-B when used. All reject log information is based on Reject Timer.

RELAY 1-3

Relay 1(K3), Relay 2 (K2), and Relay 3 (K4) are fully programmable and may use any of the four reject timers. They also may use Overhead A-B or be used as a fault or warning output. See Pg.51–Pg.52 for details regarding I/O configuration.

OUT 1-5

Out 1 (K9), Out 2 (K8), Out 3 (K7), Out 4 (K6), and Out 5 (K5) are fully programmable and may use any of the four reject timers. They also may use Overhead A-B or be used as a fault or warning output.

TIMERS

There are four independent reject timers. Each reject timer has its own travel (delay) time and reject (duration) time in the range of 0 to 60 seconds or 0 to 1200 tachometer pulses. Each reject timer runs based on time or tachometer for both travel and duration time. Only Reject Timer can use reject confirmation, a reject index device or be configured for manual reset.

FAULT

All outputs except Reject (K1) can be configured as a fault output.

WARNING

All outputs except Reject (K1) can be configured as a warning output.

OVERHEAD A-B

Overhead A-B runs via Reject Timer and is used for an overhead pusher arm. It can be set up to reject on one or both sides of the conveyor. It can also be set up to always return to the same side of the conveyor when actuated. The functionality of Overhead A-B is based on the hardware used. Additional information on how to set up Overhead A-B is in the wiring section of this manual.

INPUTS

The X8-SF Metal Detector has eight configurable inputs that can be set to “Active High” or “Active Low."

Input Voltage:

- “High” = 10 to 30 VDC
- “Low” = 0 to 0.9 VDC
- Input Impedance = 2.8kΩ
- Current Requirement = 3 to 10 mA

TACHOMETER INPUT

Voltage, Current, and Impedance specifications same as above.

Frequency: 50Hz (determined by number of poles on Tachometer and maximum belt speed)

Minimum pulse width = 0.005 seconds (5 milliseconds)

Recommend input In8 for any tachometer/encoder.

OPERATING AMBIENT TEMPERATURE RANGE

Integral Control -10° C (14° F) to 49° C (120° F)

Remote Control -10° C (14° F) to 54° C (130° F)

STORAGE TEMPERATURE

-10° C (14° F) to 80° C (176° F)

RELATIVE HUMIDITY

0 TO 95%

MAXIMUM OPERATING ALTITUDE

2,000 metres (6,561 feet)

PRODUCT VELOCITY

Minimum: 0.6 m/min (2 ft/min)

Maximum: up to 914 m/min (3000 ft/min)

Note: Actual maximums are dependent on aperture size.

ENCLOSURE

The standard enclosure is a corrosion-resistant stainless-steel construction rated for IP69 which will withstand the high-pressure washdown standard of 80° C (176° F) water at 100 bar (1450 psi).

MECHANICAL INSTALLATION

X8-SF Metal Detectors are manufactured to very stringent quality standards to ensure that they will provide years of trouble-free service. To achieve this trouble-free service, the installer must follow the installation procedures outlined in this manual. The details of these procedures are important and must be followed precisely for proper metal detector operation.

Metal detectors are extremely sensitive to very small changes in the electrical and physical environment. Unstable operation is possible if installed incorrectly. Metal detectors are sensitive to excessive vibration and may generate a false reject signal when the conveyor starts and stops. These problems can be prevented with proper installation techniques.

Please read all instructions prior to using the metal detector. Problems caused by improper installation techniques are not covered under warranty. Time invested in proper installation will be worthwhile and will provide trouble-free startup and continued reliable service.

CAUTION

To avoid injury or damage to the equipment, only qualified service technicians are to install the metal detector at customer sites in accordance with local safety codes.

INTRODUCTION

The metal detector contains several components which must be physically mounted to a conveyor or suitable stand. These include the sensing head, the control (if remote), and other devices such as a tachometer. Most X8-SF Metal Detectors sensing heads have an integral control, thus simplifying installation and wiring.

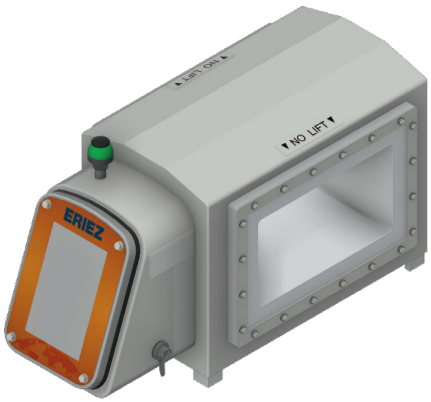


Figure 2: Metal detector (tunnel type)

The sensing head contains the coils and main electronics. The head must be installed so that the products being inspected can pass through the aperture in a consistent and controllable manner.

It is vital that the sensing head be protected from excessive vibration, physical abuse, electromagnetic interference, static electricity, and corrosive materials. The conveyor belt, chute, or other conveyance device must not contact the metal detector aperture.

If the metal detector is supplied with a "remote" control, the control enclosure is fitted with mounting tabs to allow mounting to any convenient surface. The mounting location should have minimal vibration and should be easily accessible for viewing and operating the touch screen. If mounted to a metal structure, the mounting tabs must be isolated to prevent electrical current loops. If mounted to a plasterboard wall, ensure that the mounting screws on at least one side are secured into studs using 8 mm (3/8") wood screws at least 50 mm (2") long. The other side may be mounted to the plasterboard using 8 mm (3/8”) toggle bolts rated for a minimum of 27 kg (60 lbs) of pullout and shear strength.

HANDLING

The metal detector must be handled with care during installation. Refer to the Handling Instructions for more information.

LOCATION OF SENSING HEAD

The location of the metal detector sensing head is extremely important. When selecting a location, consider the surrounding processing equipment, product velocity, and rejection of foreign objects. Operator convenience should also be evaluated. Ensure installation guidelines are followed and met before the final location is selected. If there are any questions, please contact Eriez for assistance.

METAL-FREE AREA

The metal detector monitors an electromagnetic field to detect metal. This field is predominantly contained within the aperture of the detector. However, some of the electromagnetic field extends out from the inlet and outlet of the aperture. This extended field causes the metal detector to be affected by metal in the vicinity of the aperture. Metal that is not part of the product stream must not be present in this area. The required metal-free area depends on the size of the smaller dimension of the aperture. In most circumstances, 1.5 times the smaller aperture dimension is a sufficient distance for stationary metal, 2.0 times for moving metal, and greater than 3.0 times for large moving metal (extreme cases). Testing to determine the metal-free distance will help ensure mitigation of false tripping and is strongly recommended. Refer to Figure 3.

CAUTION

For installations where the metal detector control screen presents ergonomic challenges or unsafe viewing conditions, it is recommended that a remote display be used to eliminate these issues.

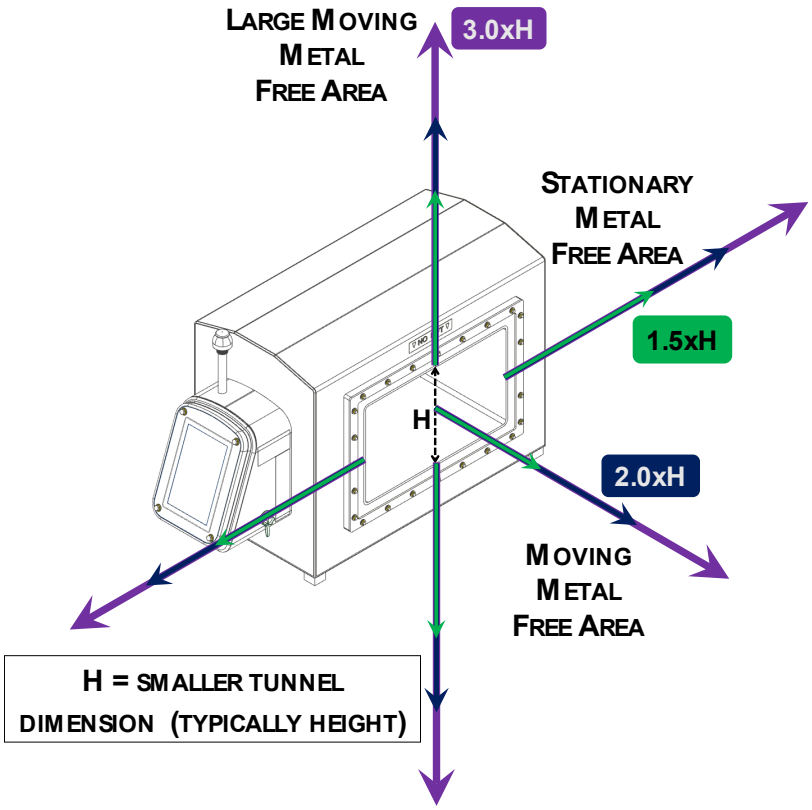


Figure 3: Metal-free area for a tunnel type metal detector

ELECTRICAL CURRENT LOOP

The most frequent problem encountered in metal detector installations is false tripping caused by intermittent electrical current loops. The electromagnetic field dissipates in strength with distance to a point that metal outside the "metal-free" area will not cause false detections. Since the field is time-varying, it will generate small electrical currents in conductive paths (metalwork) beyond the metal-free area. These currents along with ground currents from nearby equipment will not cause false tripping as long as they are constant. If the current is disrupted, the resulting disturbance in the electromagnetic field may cause the metal detector to false trip.

The schematic diagram shown in Figure 4 provides a simplified view of a typical metal detector and conveyor. The arrows represent electrical currents. The bearings supporting the pulleys and idlers turn, causing them to become "make and break" contact points.

Likewise, the cross-members of the conveyor framework represent possible break points. Over time, these connections can work loose or corrode and cause “make and break” connections due to vibration. The interruption or change of the current is a source of electromagnetic interference detectable by the metal detector.

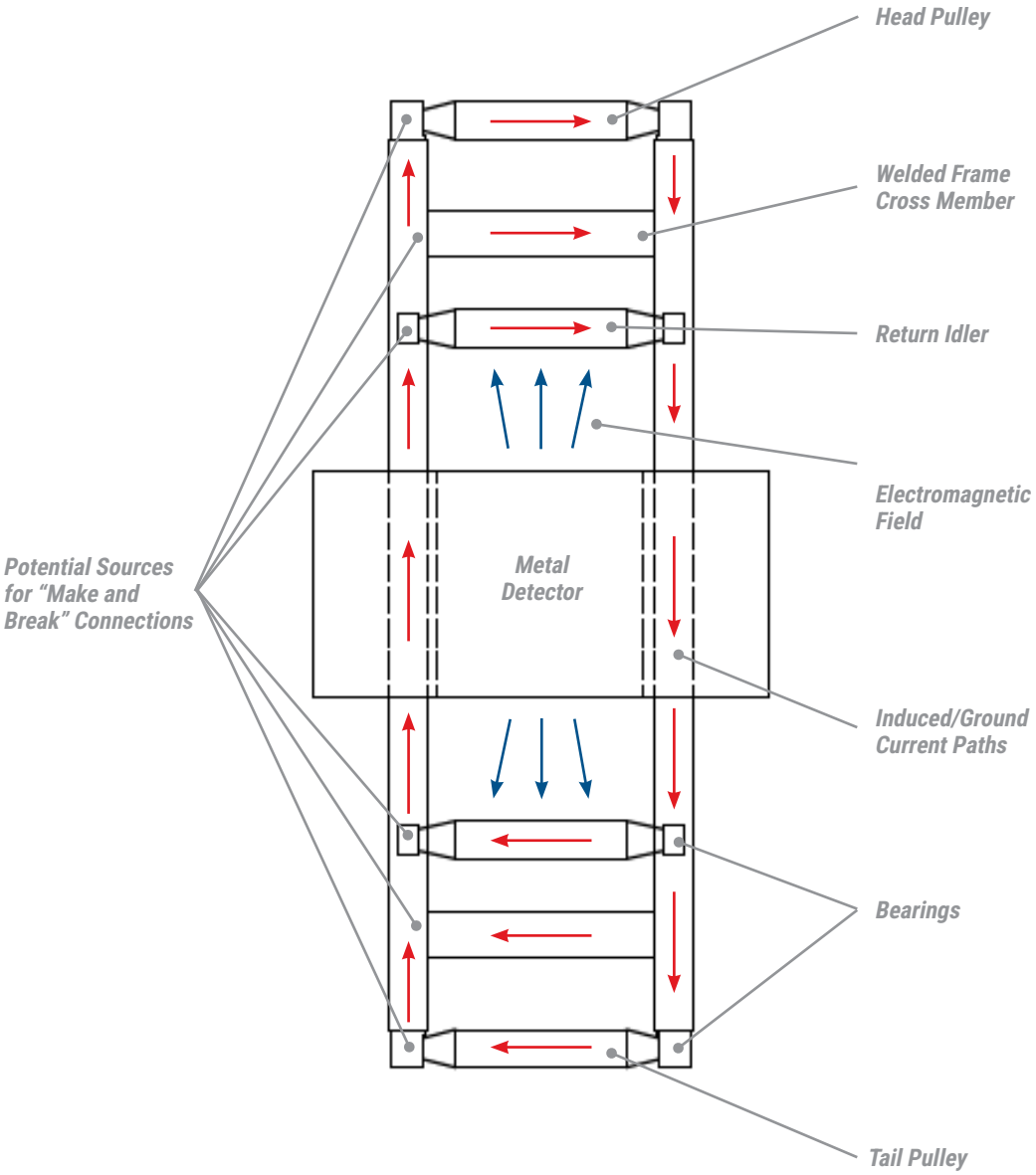


Figure 4: Potential sources for “Make and Break” connections

INSULATING CONVEYOR SHAFTS

A continuous electrical path through pulleys and idlers cannot be assured. As a result, current changes cannot be prevented in these components. They must be electrically isolated from the rest of the system by introducing an isolating medium into the conductive path. There are three common methods to accomplish this task.

The method shown in Figure 5 requires machining the end of the shaft to a smaller diameter to allow space for a nylon plastic sleeve. The outside diameter of the sleeve is the same as the inside diameter of the bearing. This sleeve breaks the electrical connection between the bearing and the shaft, thus permanently preventing current flow. **WARNING:** Do not cut through the sleeve when tightening the bearing set screw.

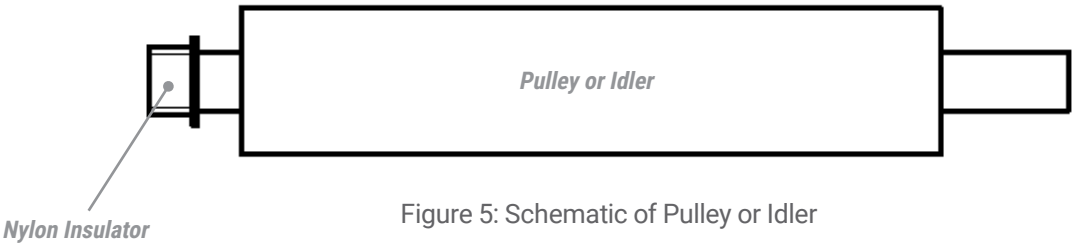


Figure 5: Schematic of Pulley or Idler

Figure 6 shows a method of insulating the complete bearing block from the conveyor frame. This requires drilling the bolt holes through the bearing block to a diameter large enough to accept an insulating shoulder washer. The bearing block should also be insulated from the conveyor frame with non-metallic insulators extending across the base of the block.

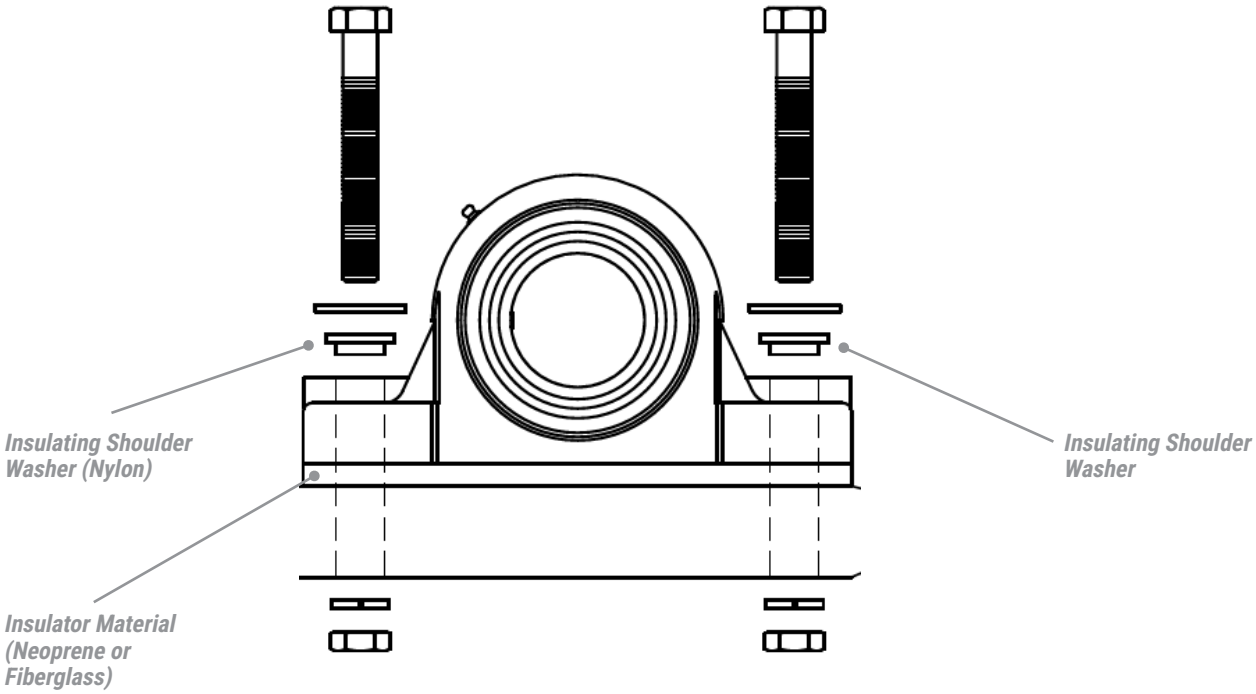


Figure 6: Bearing block on conveyor frame

Non-metallic/Plastic Bearing Block

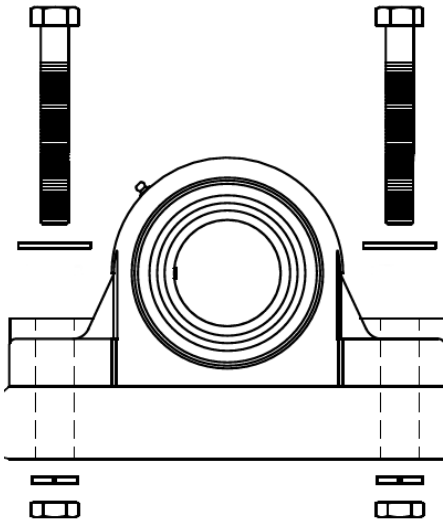


Figure 7: Recommended method for insulating bearing block

All three insulating methods are reliable. However, it only takes a small metal shaving or burr to cut through and short-circuit the insulators. A check of the integrity of the insulation with an ohmmeter will ensure everything is correctly installed. Insulating either end of the shaft will prevent current loops but will also prevent testing with an ohmmeter. For this reason, isolating both ends during testing is recommended.

Build-up of a static electric charge on the conveyor belt can also cause false tripping. A static charge can build up on pulleys or idlers that are insulated on both ends. To prevent this build-up and subsequent false tripping, the insulation must be modified to ensure a ground.

After the integrity of the insulators is checked with an ohmmeter, one end of each shaft should be electrically reconnected to the conveyor frame. If the sleeve insulating method has been used, the setscrew of one of the bearings should be extended to make contact with the shaft. This may require drilling a small hole through the sleeve and inserting a sharp pointed setscrew.

If the bearing block insulating technique has been used, simply remove one of the shoulder washers on one end of the shaft. If using the plastic bearing block method, the opposite bearing block is metallic and grounded already. The integrity of the insulators can easily be rechecked when using any of the three methods.

NOTE: If a drive pulley is powered by a metal chain, it is not necessary to remove the insulators on either end of the shaft as described above. The metal drive chain will bleed off any static charge that may accumulate on the pulley. If a non-metallic belt drive is used, insulate the conveyor pulley on the side opposite the drive motor.

PERMANENT CURRENT LOOPS

Permanent conduction paths (i.e., cross members) in the conveyor frame should be welded securely to provide a reliable path for any current that may be created. Bolted construction may eventually degrade and is not recommended unless designed and executed by experts in metal detector conveyor construction. Any conduction path that is to remain removable, or that cannot be welded or permanently bolted, must be electrically isolated from the conveyor frame.

Figure 8 shows a conveyor frame properly modified for a metal detector installation. Notice that possible breaks in the current paths no longer exist, and the only current loops in the conveyor frame are running through a permanently welded connection. These current loops will be constant and therefore will not cause false detections.

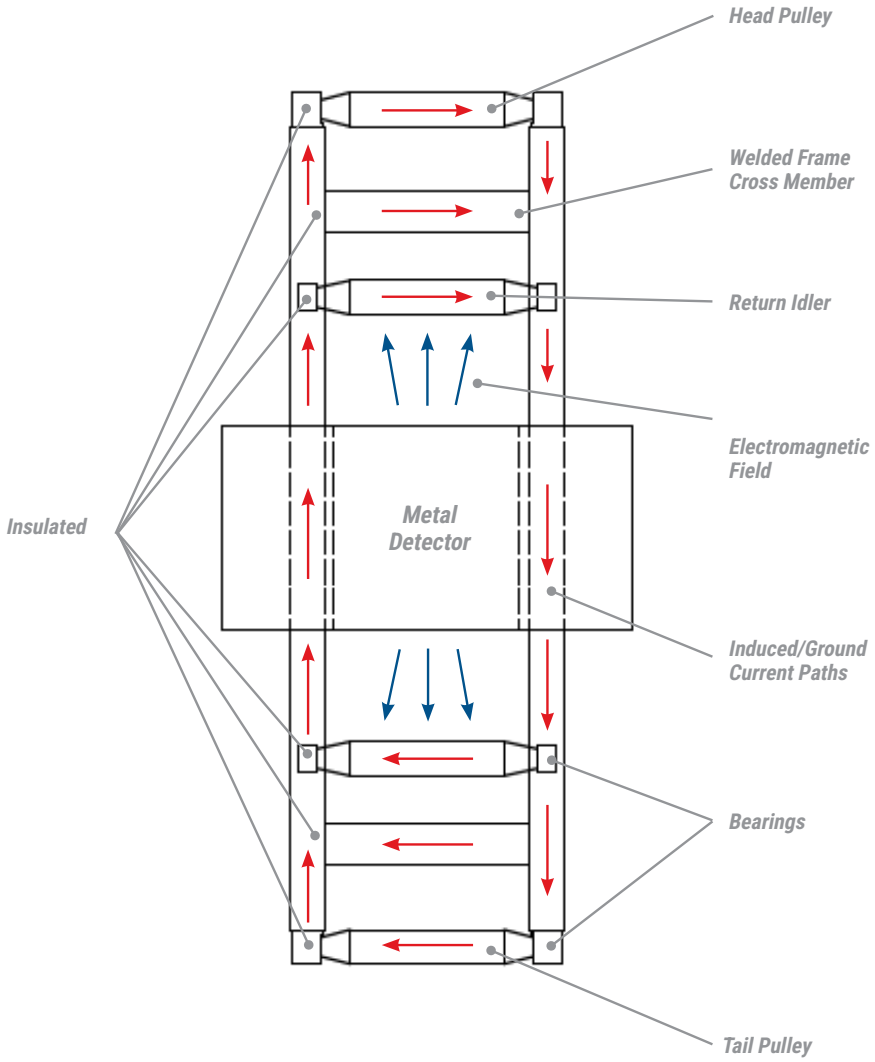


Figure 8: Properly modified conveyor frame for metal detector installation

SUPPORTING STRUCTURE

The structure that supports the metal detector sensing head must be strong, rigid, and as free from vibration as possible. Electronically, the metal detector can be configured to ignore most vibration. Improved sensitivity can be obtained by preventing mechanical vibration from reaching the detector head.

Four insulating mounting feet are supplied with the metal detector. These mounting feet must be used to ensure proper operation (Figure 9). All four mounting feet must sit flat on the supporting structure. Do not draw the feet down to the structure by tightening the mounting bolts, as this will put uneven stresses on the sensing head shell which in turn may cause instabilities in operation. If the mounting feet do not rest flat on the supporting structure, shim with appropriate washers until supported evenly.

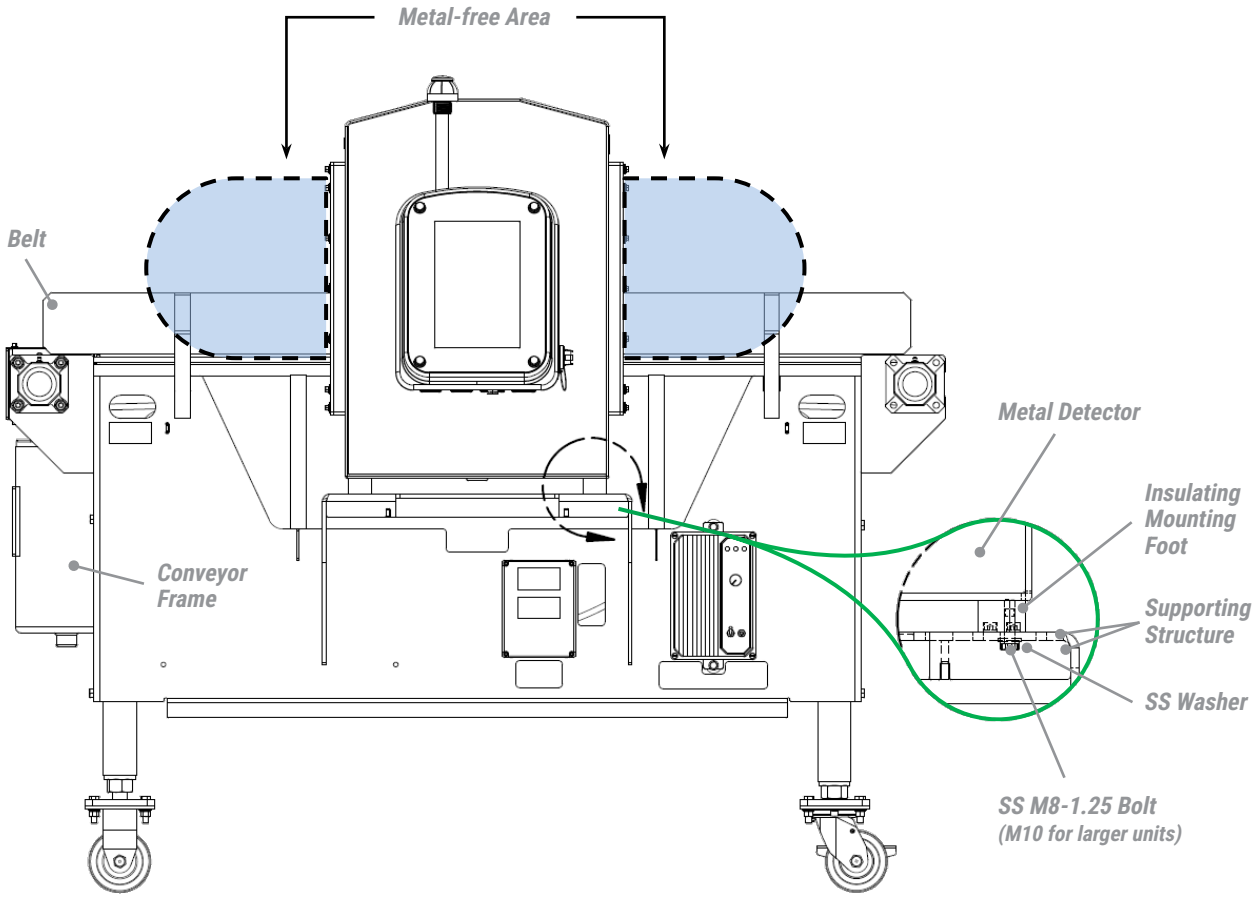


Figure 9: Metal-free area and mounting feet

NOTE: Only the insulating mounting feet and electrical connections should contact the sensing head. Conduit attached to the metal detector sensing head should utilise plastic fittings (refer to Electrical Installation).

BELTS AND BELT SPLICES

The metal detector's sensing head cannot be disassembled to be fitted around an endless conveyor belt. The conveyor must be designed to return the belt through the aperture, or the belt must be cut and spliced (non-metallic) back together. Splicing the belt with lacing or clamps is not recommended since foreign materials tend to collect at the joint and may eventually cause false detections.

A proven, trouble-free choice for metal detector conveyor belts are modular plastic conveyor belts. Eriez recommends and uses this option as they are easily maintained, and faulty sections can be changed out quickly. Conductive plastic components, belts, and metallic hinge pins or rods must be avoided. Vulcanised belt splices are the most reliable and are recommended for continuous belt applications where plastic chain cannot be used (Figure 10). If the belt is single-ply, the finger splice configuration should be used. If the belt is multi-ply, a diagonal bevel or step splice configuration is recommended.

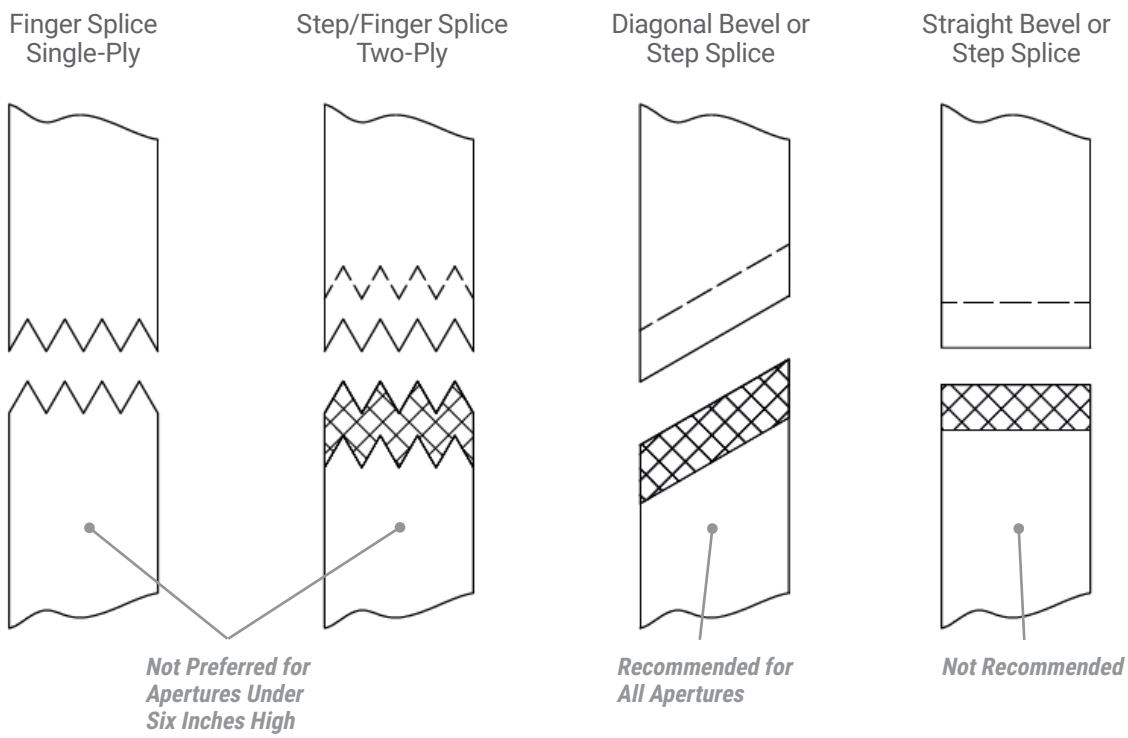


Figure 10: Conveyor belt choices

NOTE: During all splicing, it is absolutely necessary to ensure that no foreign material (especially metal) is trapped within the splice. If metal is trapped in the splice, the detector will trip each time the splice passes through the aperture. Since the metal is trapped inside the splice, it cannot normally be located and removed without ruining the belt.

CONVEYOR SLIDER BED

The conveyor belt must be supported as it travels through the metal detector. This is accomplished by providing a stationary slider bed, which must be capable of holding the belt off the aperture liner when fully loaded. The slider bed must not touch the aperture liner.

The slider bed should be made of static-resistant non-metallic material. Anti-static UHMW and phenolic are acceptable choices. Eriez has designed and incorporated a static-dissipative food grade plastic slider bed into our standard and custom metal detector conveyor systems. Most solid plastics cannot be used because these materials tend to generate static electricity as the conveyor belt slides across. “Static-resistant” plastics that incorporate metallic particles cannot be used.

PRODUCT POSITION

The product should always be guided through the centre of the aperture, both vertically and horizontally. The product must be centred regardless of the method of conveyance through the metal detector (i.e., conveyor, chute, or vertical pipe). If the same metal detector will be used to inspect multiple products with differing sizes, design the system to centre the largest product in the aperture. In such a case, be aware that the sensitivity of the detector to metal of a particular size and type may vary with the product position and may require different detector settings for the different product sizes and positions in the aperture.

REJECT PROXIMITY SWITCH

A proximity switch indicates when a package is aligned with a reject device. For example, a product in a box may need to align with a reject device such as a pusher arm. Reliable rejection requires that the proximity switch indicate when the alignment is achieved. The normal position for the proximity switch is before the reject device. The metal detector incorporates a timer capable of delaying the output until the product aligns with the reject device. Be certain not to infringe on the required detector “metal-free” area when choosing the location of the proximity switch.

ELECTRICAL INSTALLATION

INTRODUCTION

CAUTION

Electrical installation should be performed only by trained electrical service personnel, authorised by Eriez. Installation wiring should conform to National Electrical Code, or other applicable standards as required by local regulations.

All electrical connections are made within the control enclosure. Figure 12 (Pg.30) shows the IOC PCB and the electrical connections to the circuit board. For convenience, connections are pull-apart terminal blocks. The pull-apart feature allows the connections to be made outside the enclosure and then snapped back in place. Figures 13–15 (starting on Pg.31) show example connections for input/output devices and power connections to the metal detector.

WARNING – HAZARDOUS VOLTAGE

Hazardous voltages are present in this equipment when energised. All power sources must be isolated or disconnected before accessing the inside of the enclosure.
Failure to follow these precautions may result in serious injury or death.

POWER SOURCE

The wiring from the mains supply panel to the metal detector should be 14 AWG, 105C, 600V rated at a minimum and should include a dedicated earth ground wire for safety and proper operation of the metal detector. The power wiring should be run in a dedicated conduit.

CAUTION

An external disconnect switch labeled “Metal Detector” should be installed near the metal detector to allow for interruption of the power to the metal detector for service or installation. In 240 VAC systems this switch should interrupt both sides of the line. This switch should include a provision to lockout the switch for service and maintenance. The metal detector must not be positioned in a way that makes it difficult to operate the disconnect switch.

Terminate the incoming protective ground wire with an M6 ring terminal and secure it to the stud on the wall of the enclosure with an M6 star lock washer and M6-1.0 hex nut. If other connections are made to the same stud, note that this protective ground shall be applied first, and secured independently of the other connections. Strip the Line and Neutral wires 7mm (9/32″) and secure them in the appropriate terminals on TB3: For 120V supply, connect Line to terminal 19, and Neutral to terminal 21. For 240V supply, connect Line 1 and Line 2 to terminals 19 and 21 in either order.

The best insurance against electrical noise and false tripping is to run a separate circuit to the metal detector from the main power bus. This circuit should be free of all loads except the metal detector. If this is impractical, reliable operation can often be obtained by powering the metal detector from a “clean” lighting or instrument circuit. This circuit must be free of inductive loads such as motors, solenoids, and motor starters. If the metal detector must be powered by a less than favourable source, a constant voltage transformer with harmonic neutralisation can be used to eliminate or reduce false tripping caused by line noise. This transformer should be mounted within 1–1.5 metres (3–5 feet) of the metal detector.

Main Circuit Breaker 1 protects the metal detector electronics. It is located on the right side of the control door inside the control housing. Auxiliary Circuit Breaker 2 is used for auxiliary power. It is located on the left side of the control door. The incoming power source (at terminals 19 and 21) is connected through Auxiliary Circuit Breaker 2 to terminals L1B (4, 13) and L2B (6, 15). These terminals may be used to power various pieces of auxiliary equipment. Terminals 5 and 14 may be used as protective ground connections for the auxiliary equipment. The circuit breaker has limited capacity as indicated in the specifications. If a piece of auxiliary equipment requires power in excess of the circuit breaker capacity, the auxiliary equipment must be controlled from an intervening relay and powered from a separate source. Do not use terminals 5 and 14 as protective ground connections for equipment that is powered from a separate source.

CAUTION

L1B and L2B are not disconnected by Main Circuit Breaker 1. They are disconnected by Auxiliary Circuit Breaker 2.

The metal detector power source must contain a reliable ground (earth) connection. It must be connected to the protective earth terminal of the metal detector. The metal detector should be grounded at one point through the power supply ground wire. No other ground connections are permitted, including mounting hardware and conduit.

CAUTION

For continued compliance with electrical safety standards, the protective earth connection from the power source must be connected directly to the protective terminal on the wall of the enclosure. This is required to be the FIRST connection to the terminal, and secured with a star lock washer and nut, independent of any other connections to the terminal.

The metal detector is equipped with electronic filter circuits to reduce incoming electrical noise. Inductive loads sharing the same power circuit usually create noise. Although there are filters, there is a limit to what the metal detector can withstand without false tripping.

CONNECTIONS TO INPUT/OUTPUT DEVICES

WARNING – HAZARDOUS VOLTAGE

Hazardous voltages are present in this equipment when energised. All power sources must be isolated or disconnected before accessing the inside of the enclosure.

CAUTION

Verify input power requirements before making any connections.

The X8-SF Metal Detector has four mechanical and five solid state relays, for a total of nine programmable outputs, each with one set of contacts.

There are four programmable “Form C” (NO-C-NC) output relays rated at 5 A up to 250 VAC or 30 VDC each. These relays are wired as fail-safe. If the power at L1B and L2B is used to power the relays, its maximum available current is 5 A and the voltage will be equal to that applied at L1 and L2 on TB3. Power at L1B and L2B passes through Auxiliary Circuit Breaker 2, which is located on the left side of the control door. Connect to L1B and L2B only if the voltage and current ratings are compatible with the auxiliary device to be used.

The relay wiring should be 18 AWG, 105C, 600V rated at a minimum.

Reject (Relay K1) has one set of “Form C” (NO-C-NC) contacts. It is located at terminals 1, 2, and 3 on TB1. “Reject” is the primary reject device output. “Reject” must run via Reject Timer or Overhead A-B when used. All reject log information is based on Reject Timer only. Reject Timer is controlled using the “Reject Setup” screen which is found on the Running Product Settings page.

Relay 1 (Relay K3) has one set of “Form C” (NO-C-NC) contacts. It is located at terminals 7, 8, and 9 on TB1.

Relay 2 (Relay K2) has one set of “Form C” (NO-C-NC) contacts. It is located at terminals 10, 11, and 12 on TB2.

Relay 3 (Relay K4) has one set of “Form C” (NO-C-NC) contacts. It is located at terminals 16, 17, and 18 on TB2.

There are five programmable “Form A” (SPST-NO) solid state relays each rated at 500 mA up to 40 VDC. These relays can be wired as NPN or PNP. The output can be set to NO or NC under normal running conditions. If +24V is used to power the relays, the maximum current available is 2A. This current rating is controlled by a resettable fuse (F1). Only connect +24V if the voltage and current ratings are compatible with the auxiliary device being used.

NOTE: Terminals 23, 33, and 43 are DC common. Since the metal detector is grounded only by the input power supply ground, these terminals must not be connected to earth ground by an auxiliary device.

Out 1 (Relay K9) has one set of “Form A” (SPST-NO) contacts. It is located at terminals 24 and 26 on TB4.

Out 2 (Relay K8) has one set of “Form A” (SPST-NO) contacts. It is located at terminals 25 and 26 on TB4.

Out 3 (Relay K7) has one set of “Form A” (SPST-NO) contacts. It is located at terminals 27 and 29 on TB4.

Out 4 (Relay K6) has one set of “Form A” (SPST-NO) contacts. It is located at terminals 28 and 29 on TB4.

Out 5 (Relay K5) has one set of “Form A” (SPST-NO) contacts. It is located at terminals 30 and 31 on TB4.

Relay 1 - Relay 3 and Out 1 - Out 5 are fully programmable and may use any of four reject timers or Overhead A-B. They can also be used as a fault or warning output. Relay 1—Relay 3 and Out 1—Out 5 are controlled using the “Reject Setup” screen which is found on the Running Product Settings page.

RELAY NOTES

If switched power is needed for an external device in excess of the 5A 240VAC source or the 2A 24VDC source, it must be supplied from an external source using an auxiliary relay. The voltage and ampere ratings for devices switched by the relays should not exceed the relay ratings.

INPUTS

IN 1—IN 8 are bi-directional opto-coupled inputs, which can be configured for several different functions described in the following pages. Electrical requirements are listed in the Specifications section. Note that the analog input/output wiring should be 24 AWG, 105C, 300V rated at minimum.

NOTE: Terminals 23, 33, and 43 are DC common. Since the metal detector is grounded only by the input power supply ground, these terminals must not be connected to earth ground by an auxiliary device.

Ain1 and Ain2 are 24V active high inputs only. The maximum voltage for each input is 30VDC. The threshold is 12VDC.

TACHOMETER INPUT

Applications having variable speed product flow and requiring automatic reject timing use this input. A tachometer is used to allow the metal detector control to monitor product speed and reject according to the distance the product has traveled rather than according to elapsed time since detection (Note: a “Tachometer Fault” occurs if the input does not receive pulses from the tachometer for a period, defined on the “Advanced Reject Settings” screen).

REJECT INDEX

The metal detector can be used to scan and automatically reject packages. In this application, a reject index is used to sense the location of the package so it can be reliably rejected. The device can be a mechanical switch, photo-eye, or any other device that is capable of precisely locating the package.

REJECT CONFIRMATION

The reject confirmation input is used to monitor the function of the reject device. It is usually a limit switch attached to the reject device that indicates it is functioning. For example, if you were using a pusher bar, the reject confirmation switch would be wired to the reject confirmation input and positioned in such a way that it closes as the pusher bar reaches maximum extension.

REJECT RESET

The metal detector has four timers, one of which is a “Reject Timer” connected to the “Reject Relay." The Reject Timer has the option of being set to either manual or automatic reset mode. Manual Reject Reset is typically used for a stop belt reject. When the Reject Timer is set to manual reject reset and a rejection occurs, a password protected button will appear at the bottom centre of the screen to reset the metal detector. Another option is to wire a reject reset button to one of the eight input connections to reset the timer. Typically, a momentary push-button switch is used for this purpose. The logic can be set to either NO or NC and the specific input selected. When either manual reset is performed, the Reject Relay will be reset.

PRODUCT COUNTER

A photo-eye or limit switch can be used to detect and count each package that passes through the metal detector. The product count is displayed on the Home screen. Note that a single physical device (e.g., photo-eye) can be used for product counting and for the reject index; in this case the photo-eye output should be connected to two inputs on the metal detector, one configured as Reject Index, and another as Product Counter.

PRODUCT CHECK

A sensor placed after the reject device/mechanism. The purpose for this function is for package tracking, conveyor backup, and missed rejected packages.

REJECT BIN FULL

Applications that use a reject bin can be fitted with a sensor. The reject bin full sensor will indicate when the bin is full and requires emptying.

REJECT BIN DOOR

Applications that require monitoring of the reject bin door. This function allows for a timeout for how long the door can be open before the door must be shut. The function can also allow notification of reject door bypass if used with reject bin door lock output function.

OVERHEAD A/B

Applications that use overhead pusher arms as reject mechanism. These functions need to be used in conjunction with overhead A/B outputs to determine the position of the reject mechanism.

GOOD/DEFECTIVE COUNTER

A photo-eye or limit switch can be used to detect and count each package that passes by the reject mechanism. The product count is displayed on the Home screen.
Note: Only a single function (good or defective) can be used for counting as well as a product counter.

FOLLOWER

A function that allows for an input to be mirrored on an output. This function needs to be used with the output function “input follower” to work.

AIR PRESSURE FAILURE

This input configuration can be used to provide an “Air Pressure Failure” fault or warning when the air supply is lost. Connect a pressure switch to the reject devices’ air supply and configure the input to be active when air pressure is less than the required value.

CONDUIT

Wiring to and from the metal detector should be routed through conduit. High voltage wiring for the power supply and reject devices should not be in the same conduit as low power sensor wiring (i.e., tachometer and reset switch). Keep all metal detector wiring separate from electrical supplies carrying heavy or switched loads. This is especially important for variable speed motor control wiring. Interference from electrical noise can be greatly decreased by following these guidelines. The use of metal conduit has the potential to create a ground path unless plastic fittings are used to attach the conduit to the metal detector housing. Always use a plastic fitting for this purpose to avoid potential false trips.

POWER SWITCH

The on-off circuit breakers/switches located inside the control enclosure are intended to be a service convenience only. It is recommended that the metal detector always remain ON to provide optimum performance. This also enhances the longevity of the electronic components.

USB, ETHERNET CONNECTORS

A USB connector (for exporting report logs) and optional Ethernet connectors are located on the bottom of the control. These connectors are rated for washdown, when the cap is installed and locked, or a matching washdown rated cable is installed and locked. Before installing the cap (or cable), ensure the rubber O-ring is in place.

Figure 11: USB connector and cap

HOLEPLUGS

On the bottom of the control there are six conduit entry holes. Five of these holes have sealing plugs installed at the factory. The sixth hole has a plastic plug installed. This plastic plug must be removed. If any other plugs are removed, they shall be replaced with a non-metallic conduit fitting. In order to maintain the IP69 rating, plugs must conform to the aforementioned ratings and be installed properly. Once installed and snug, turn the wing nut one and one-half turns or more to compress the rubber gasket. Visually check to ensure the gasket is compressed.

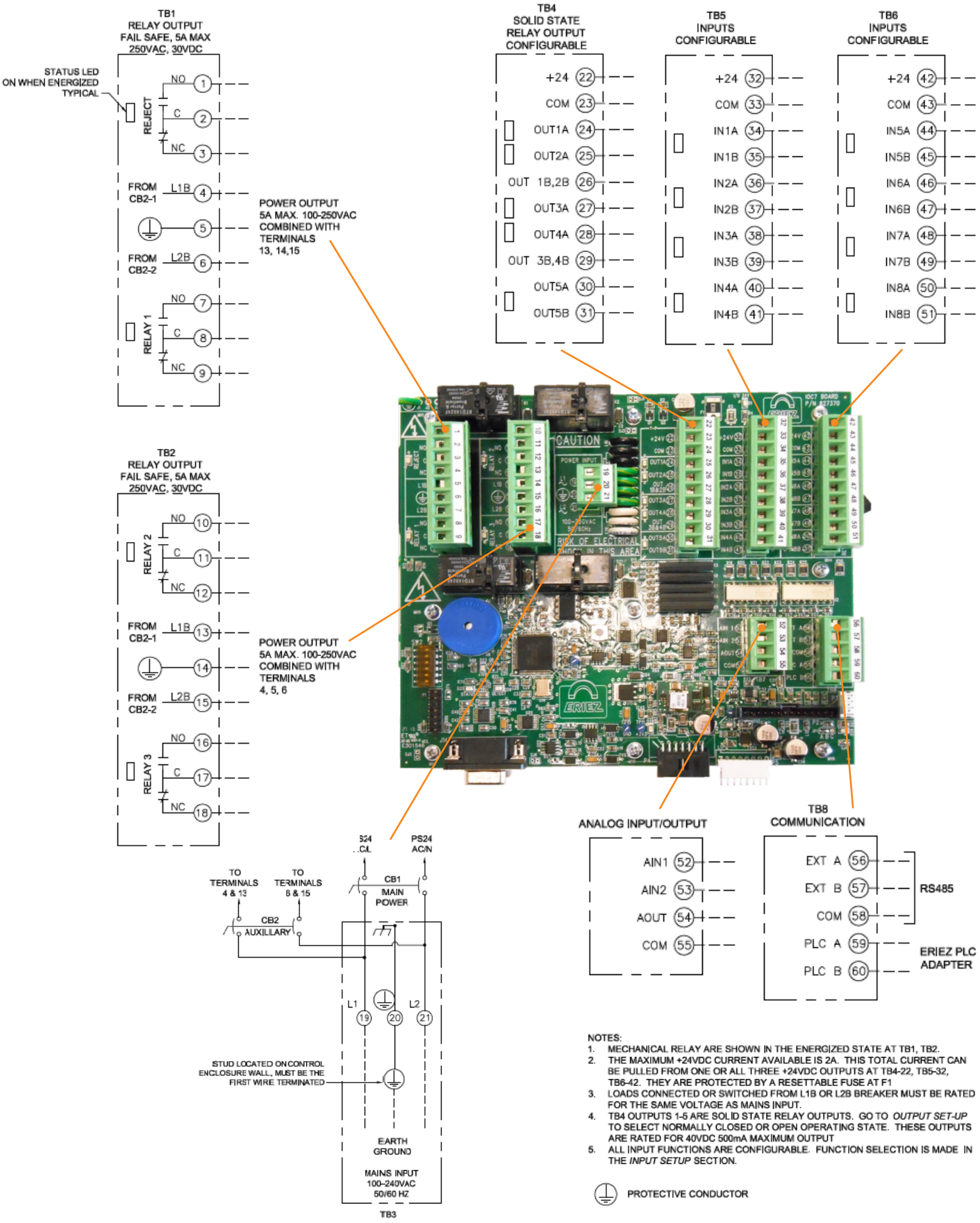
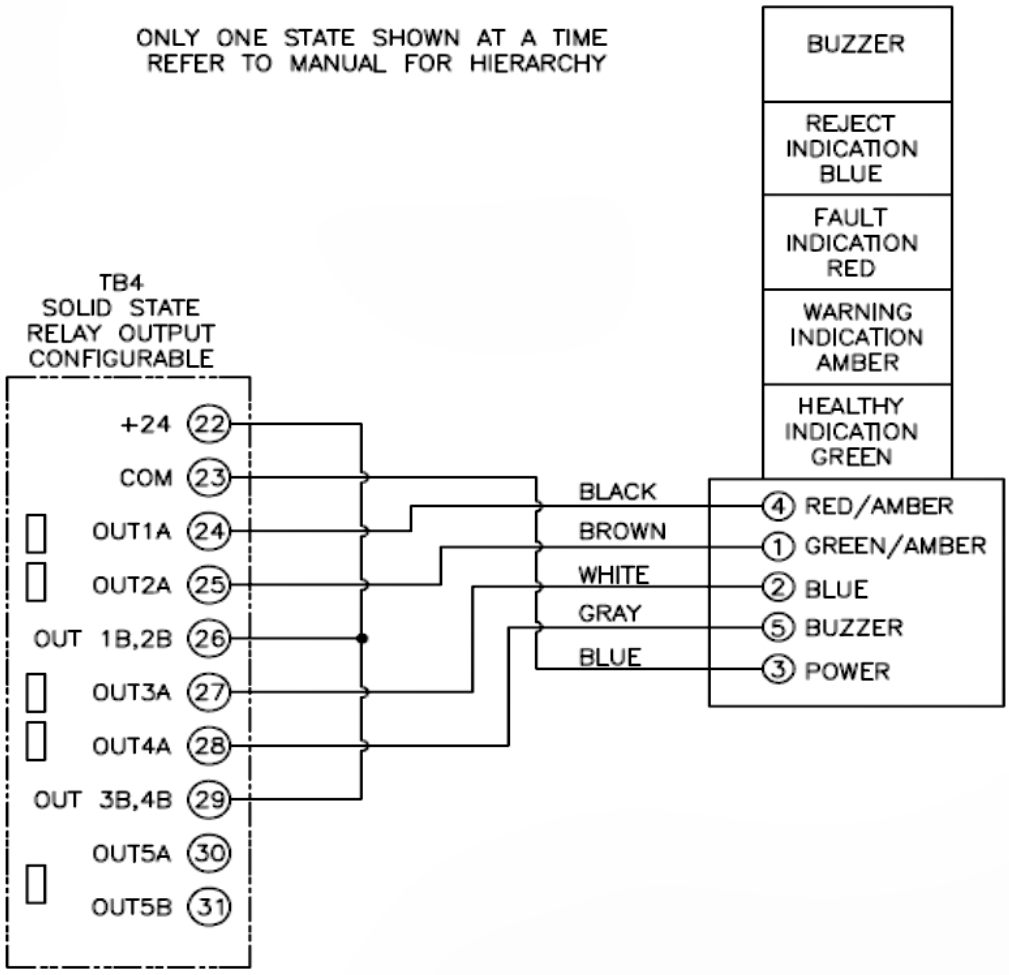


Figure 12: Terminal Connections

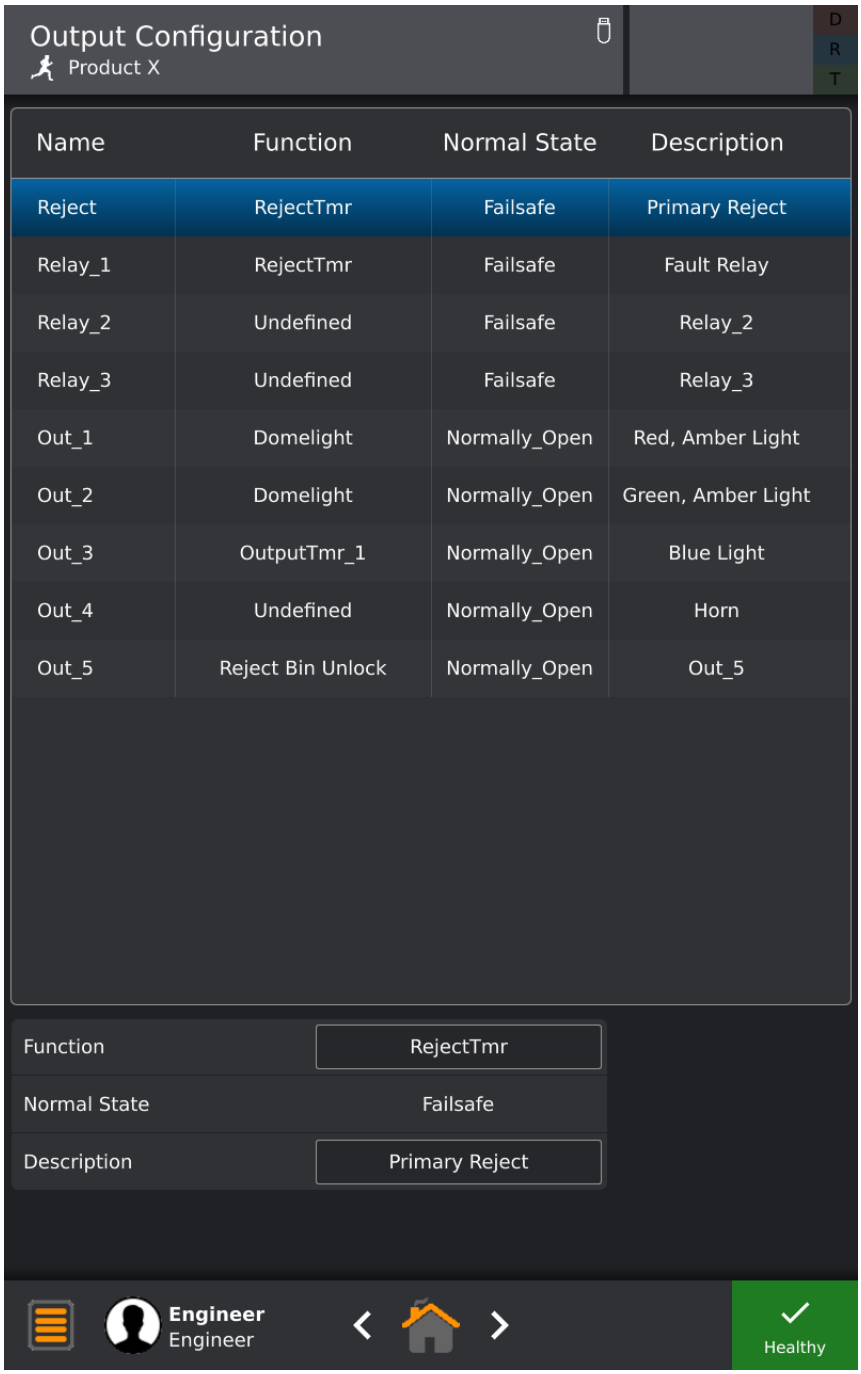
DOME LIGHT WITH BUZZER

1. The dome light is rated IP69.
2. The dome light only shows one colour at a time.
   - A. The dome light uses a priority hierarchy.
   - B. The Reject (typically blue) has the highest priority.
   - C. The Fault (typically red) has the second priority.
   - D. The Warning (always yellow) has the third priority.
   - E. The Ready status (always green) has the lowest priority.
   - F. The red and blue are interchangeable for customers that require a red reject, through the output screen.
3. The buzzer is independent of the lights.

Figure 13: Dome light with buzzer



DOME LIGHT OUTPUT SETUP



Typical Dome Light Output Setup

The dome light uses outputs 1 through 4. To make the reject light red instead of blue, swap the function of Out_1 and Out_3.

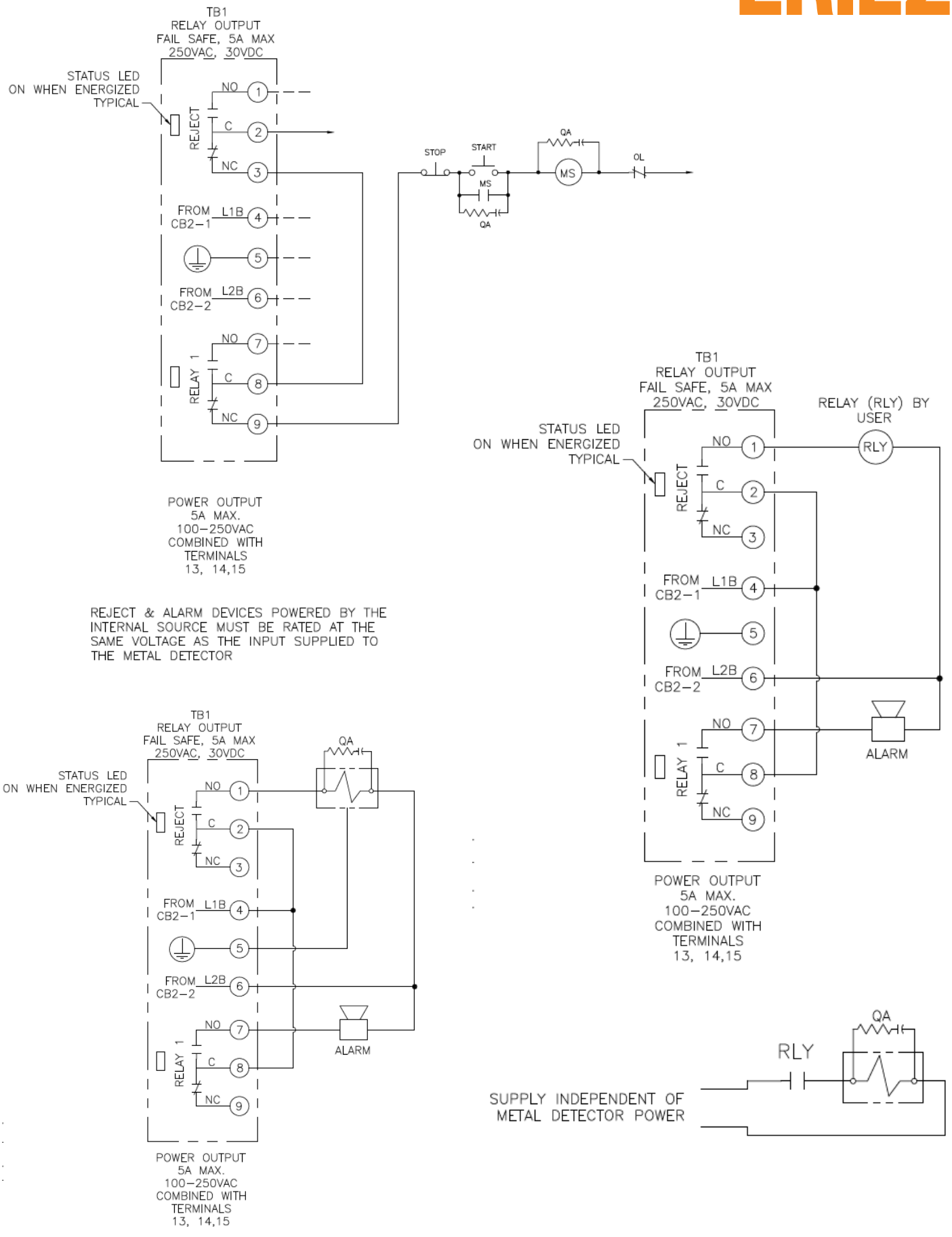


Figure 14: Output connection examples

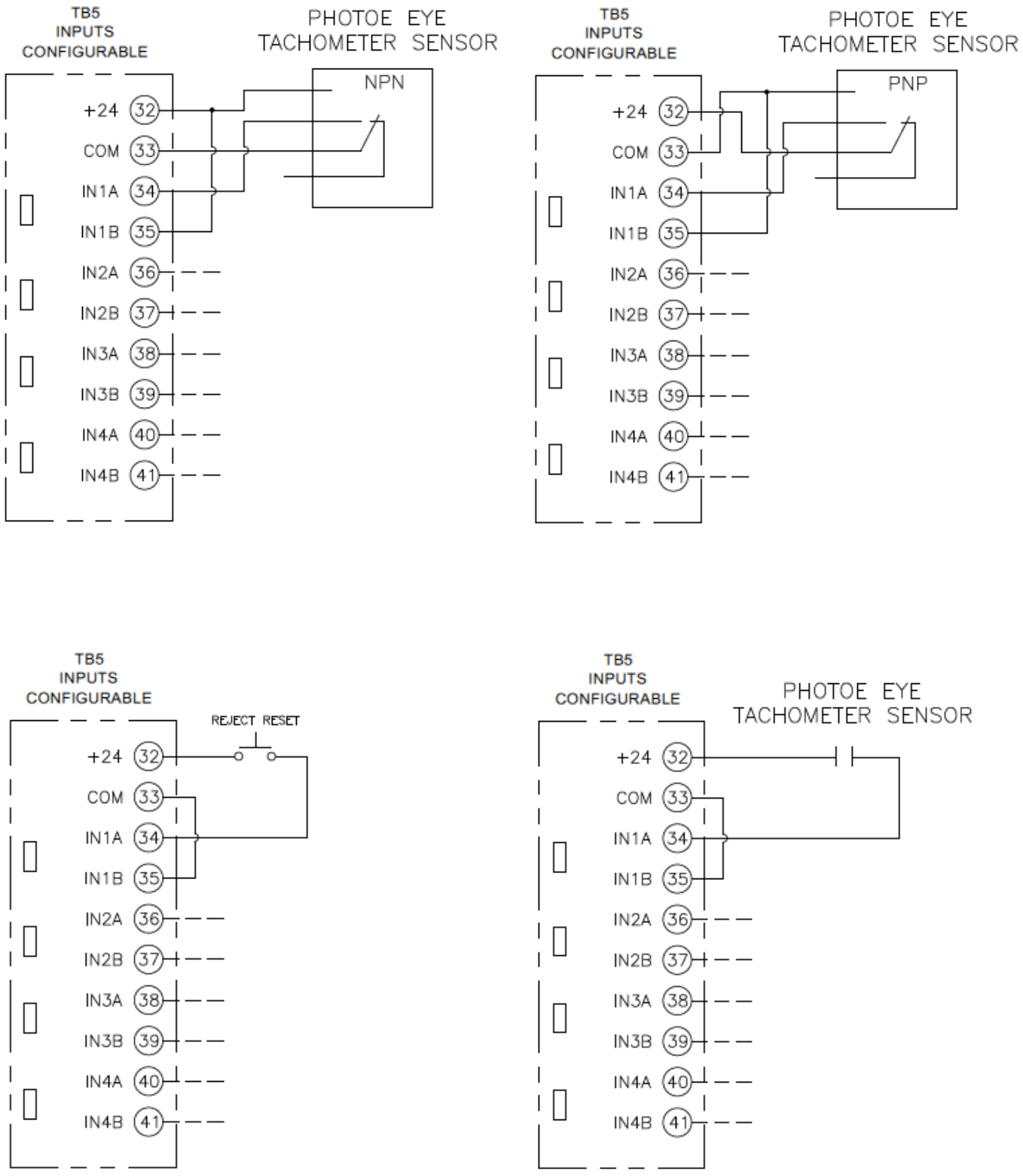
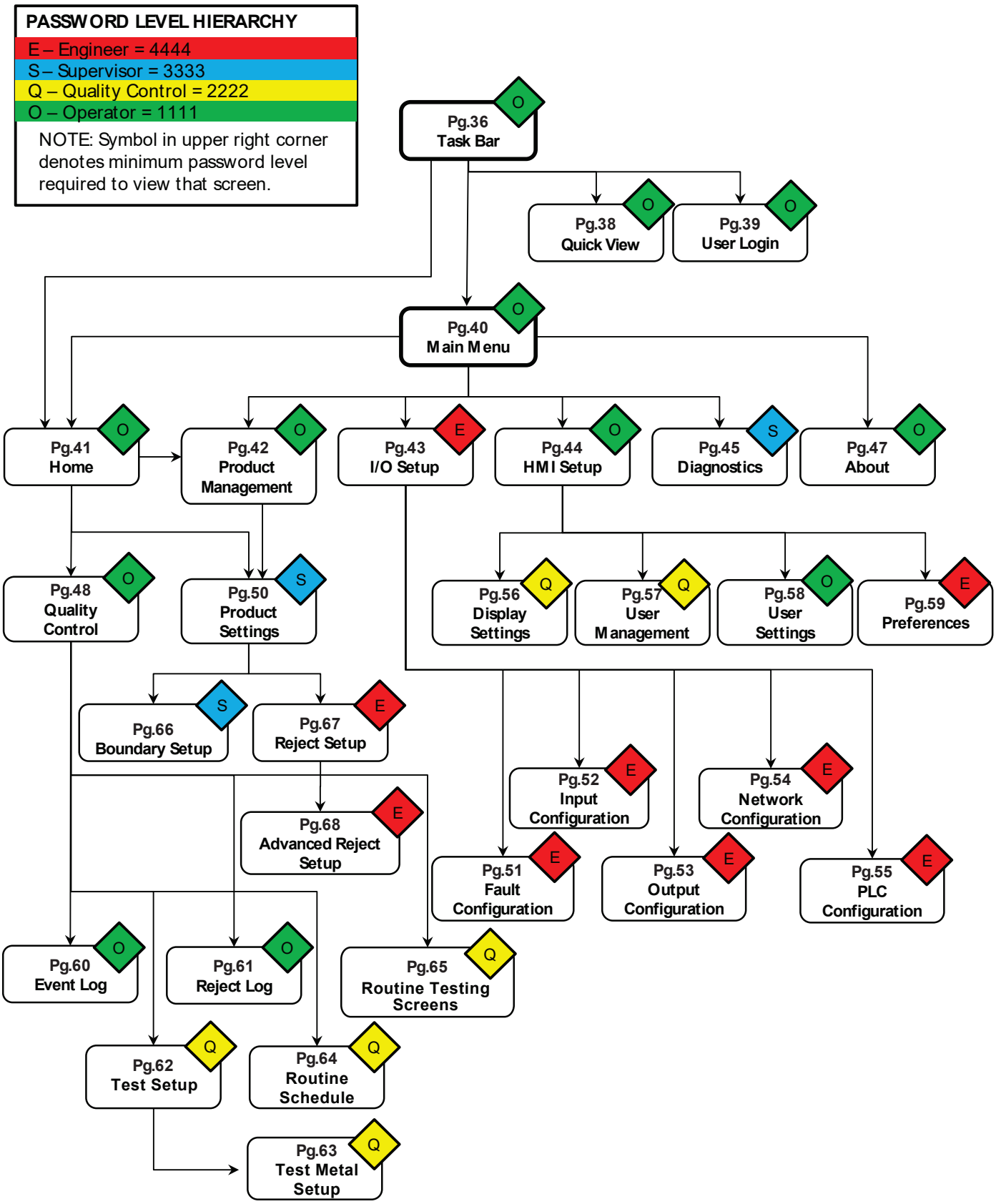


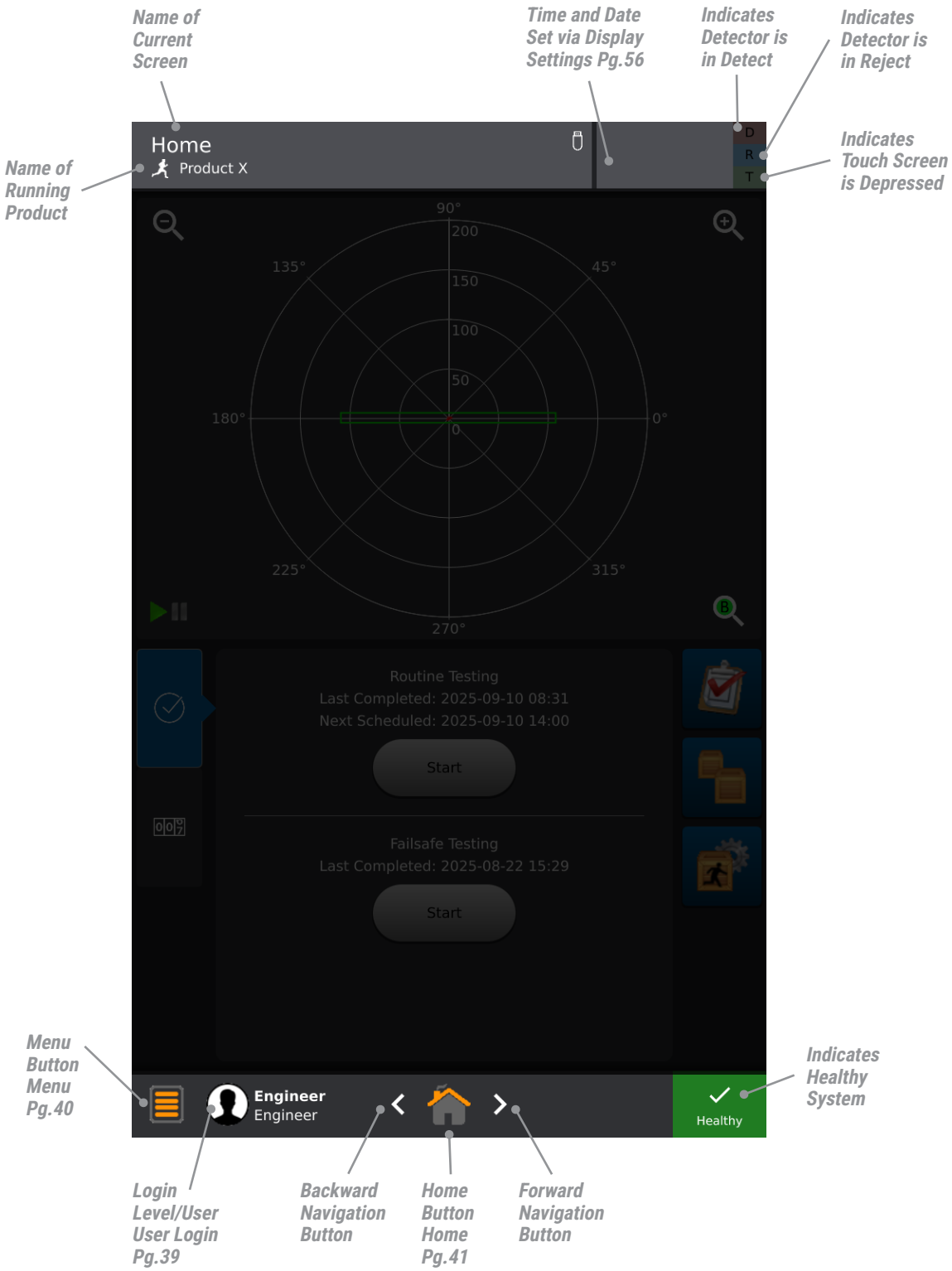
Figure 15: Input connection examples

USER INTERFACE - MENU MAP



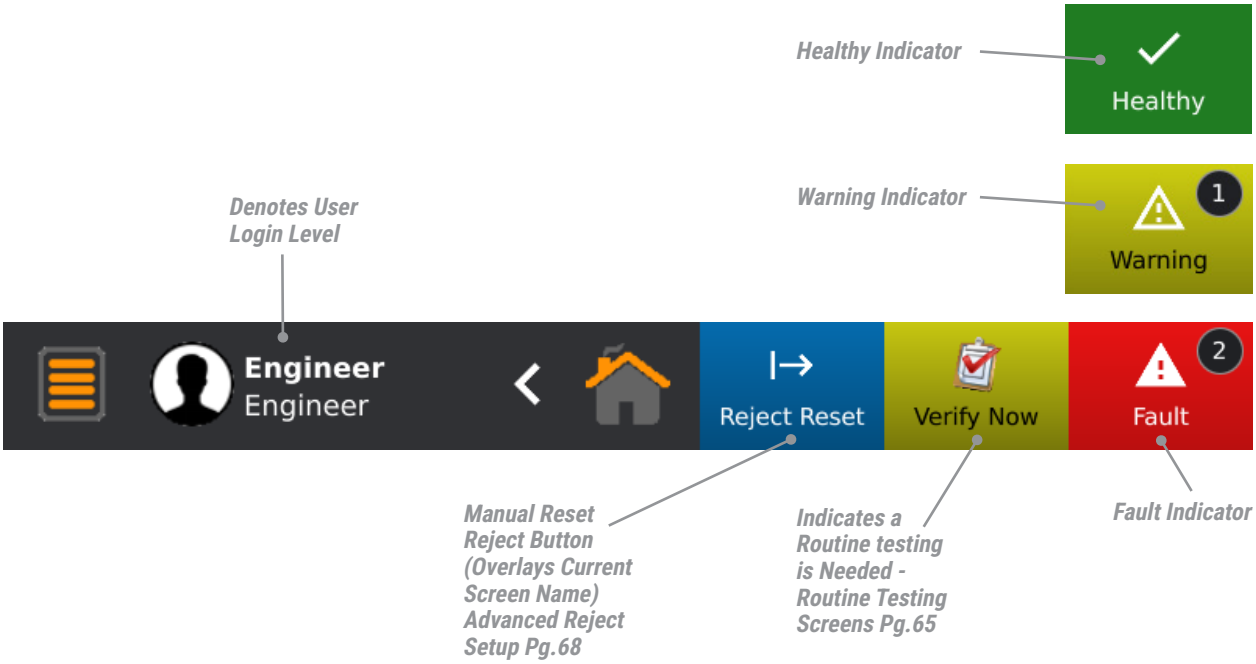
Need Help? Check out our "How To" Guides on Pg.69

TASK BAR



NOTE: The Task Bar is accessible from all screens.

OTHER TASK BAR INDICATORS



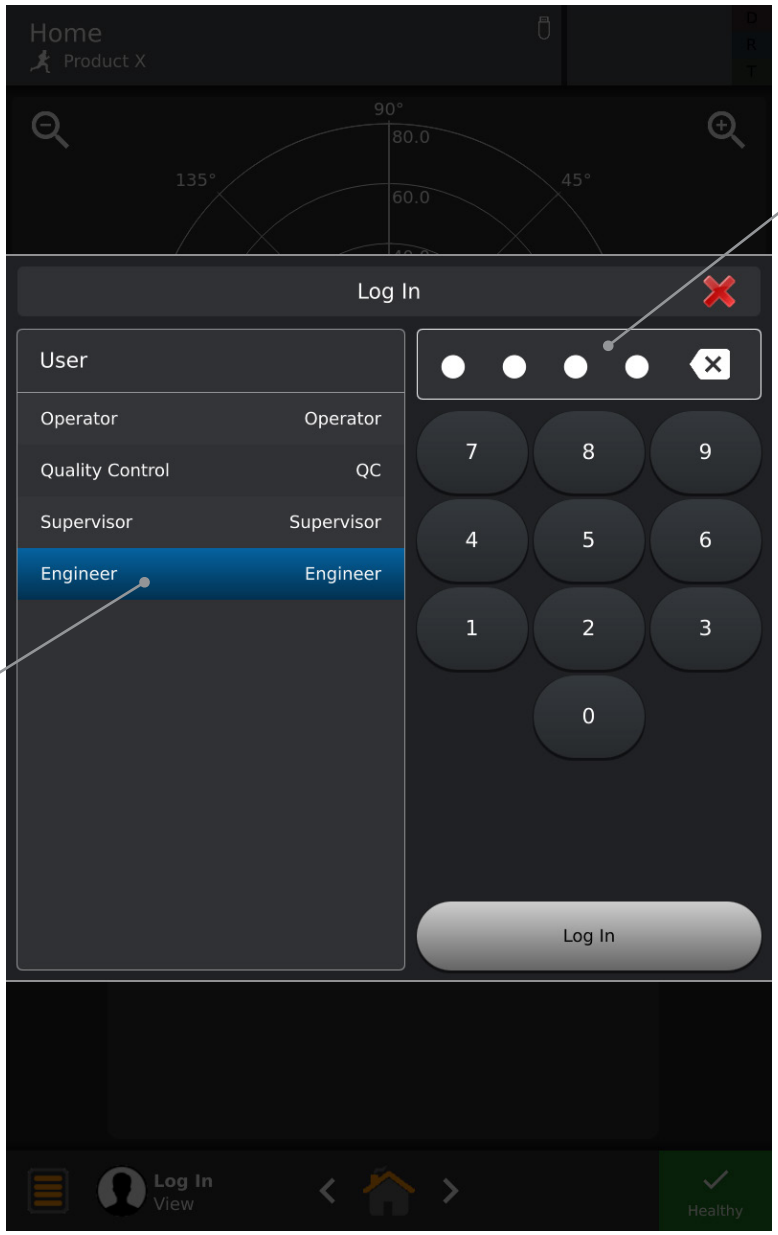
Pressing the Health, Warning, or Fault indicator will bring up the Quick View Pg.38

QUICK VIEW

NOTE: If a Fault and Warning have both occurred, the Fault Indicator will take precedence over the Warning Indicator.

NOTE: This page is accessible from any screen where the health status indicator is visible.

USER LOGIN

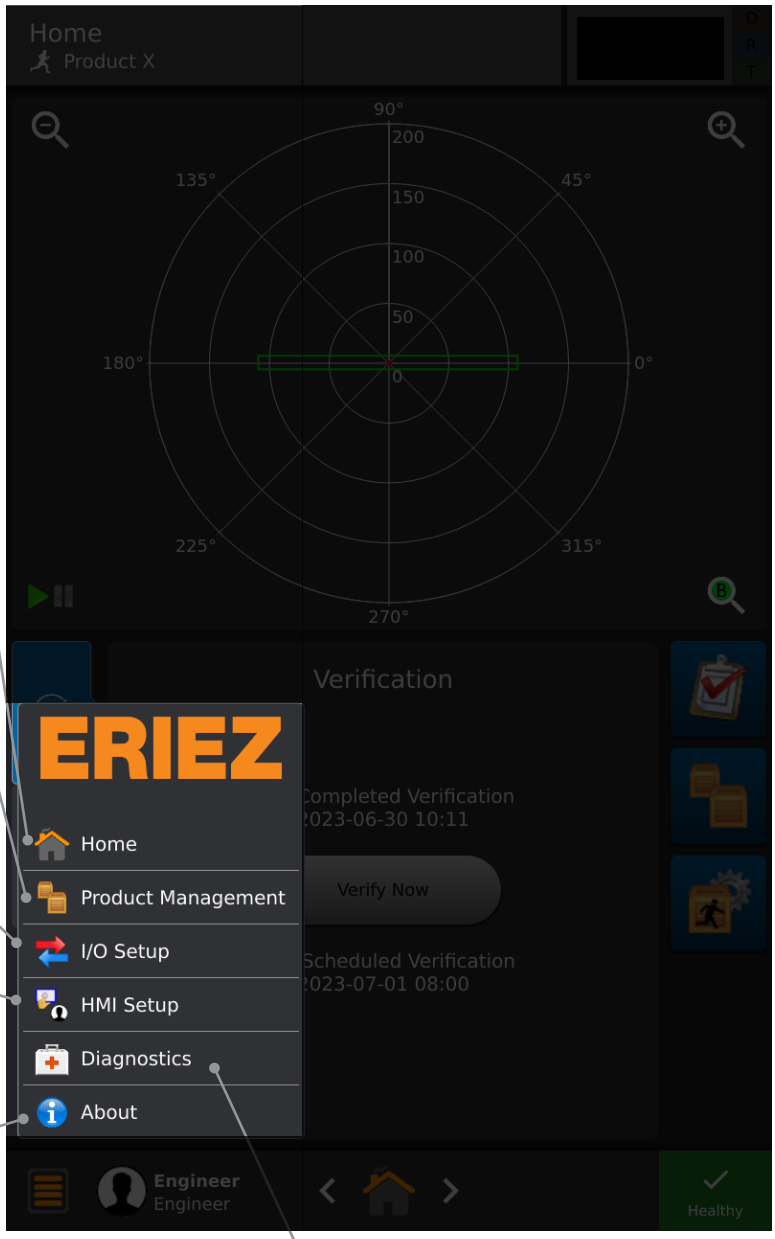


Enter a Password
4 Digit Maximum

Default Users
See User Management Screen for More Options
Pg.57

NOTE: Entering an incorrect password will revert you to the "View" level. The "View" level has no user functionality

MAIN MENU



Displays Graphing Features and Commonly Used Functions Pg.41

Adds/Deletes/Modifies Products and Selects "Running Product" Pg.42

Configures Faults/ Inputs/Outputs/Network Requires "Engineer Level" Pg.43

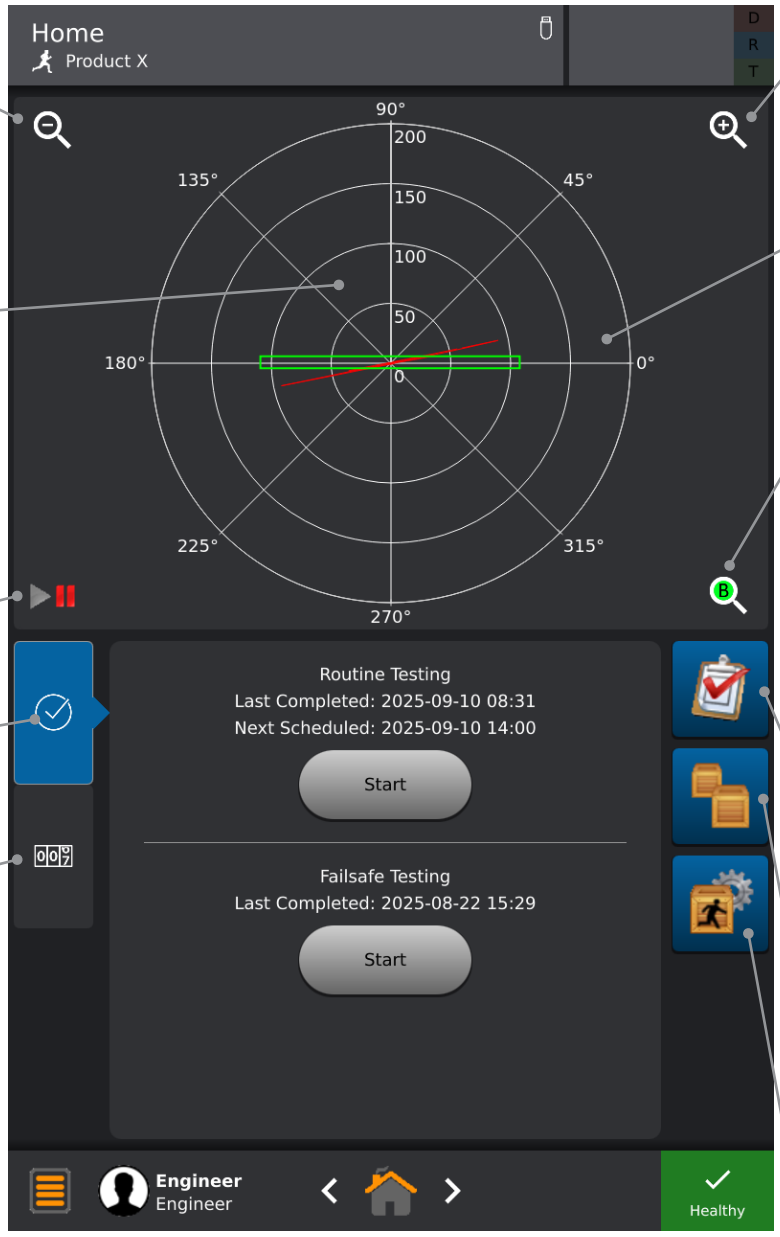
Modifies Display and User Login Options Pg.44

Displays Software Versions Pg.47

Displays Circuit Board Diagnostic Information Requires, at least "Supervisor Level" to view, see Pg.45

NOTE: The Main Menu is accessible from the Task Bar

HOME SCREEN



Zoom Out

Zoom In

Product Signal (red)

Boundary (Green)

Zooms to Product Signal or Boundary Setting

Starts and Pauses Live Graphing Feature

Testing Tab shows scheduled and last completed tests

View Event/Reject Log and Testing Info

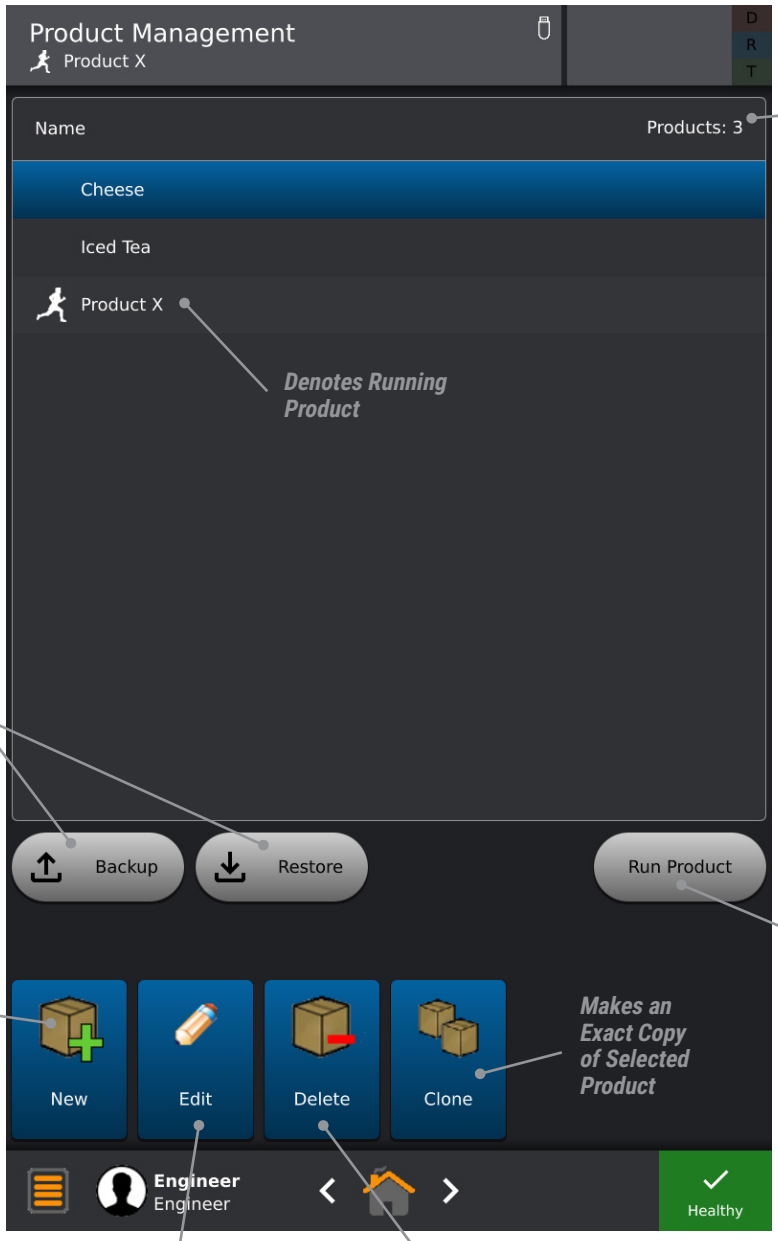
Counters Tab Counts products and reject if inputs are configured Pg. 52

Adds, Deletes, Modifies Products, and Selects "Running Product" Pg.42

View and Edit Boundary, Reject Setup, Belt Speed, Frequency—Requires at least "Supervisor Level" to view

NOTE: This is the default screen when the detector is initially turned on and logged into Engineer level.

PRODUCT MANAGEMENT



List of Products (Up to 100 Products Can be Stored)

Denotes Running Product

Performs Backup/Restore of Product Settings Requires "Engineer Level" to View

Press to Make Current Selection the Running Product

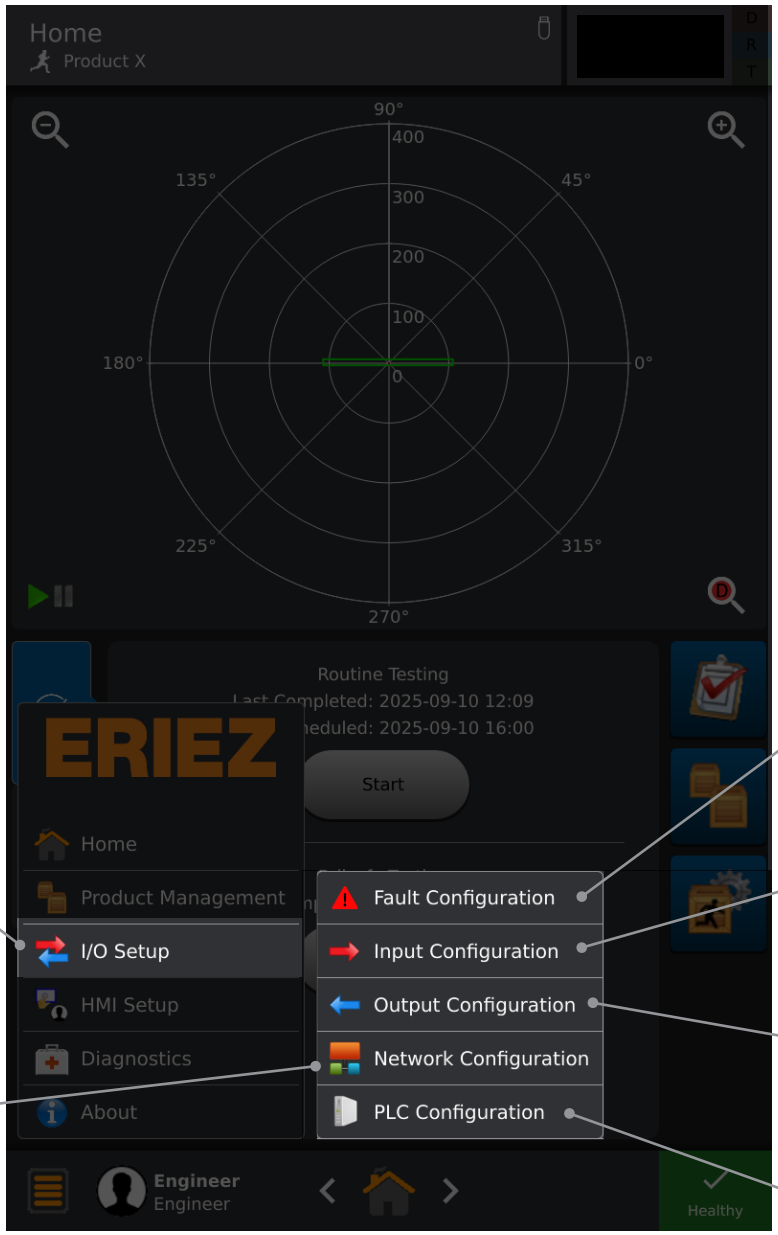
Runs New Product Wizard Pg.70

Makes an Exact Copy of Selected Product

Allows Editing of Product Name and Set up Requires at least "Supervisor Level" to View

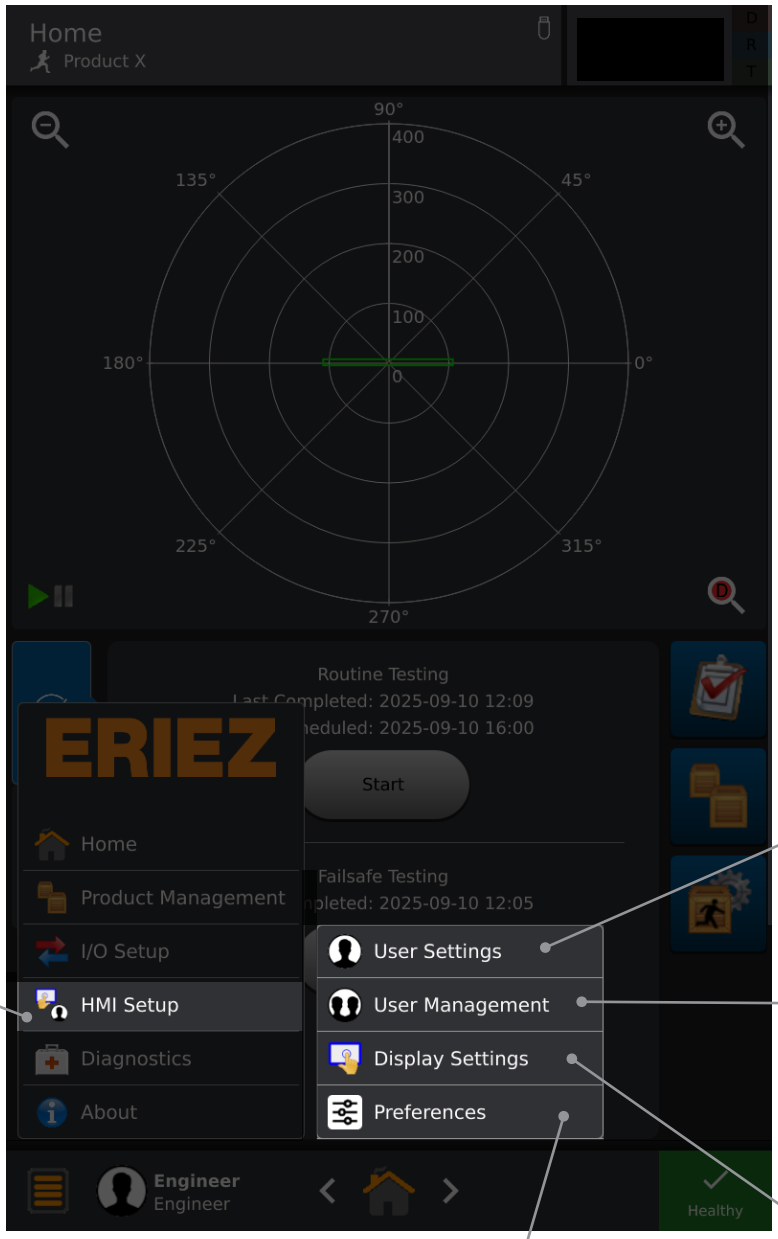
Deletes Selected Product Requires "Engineer Level" to View

I/O SETUP



NOTE: This screen requires "Engineer Level" to view.

HMI SETUP



Pressing the HMI Setup Button Displays the Submenu to the Right

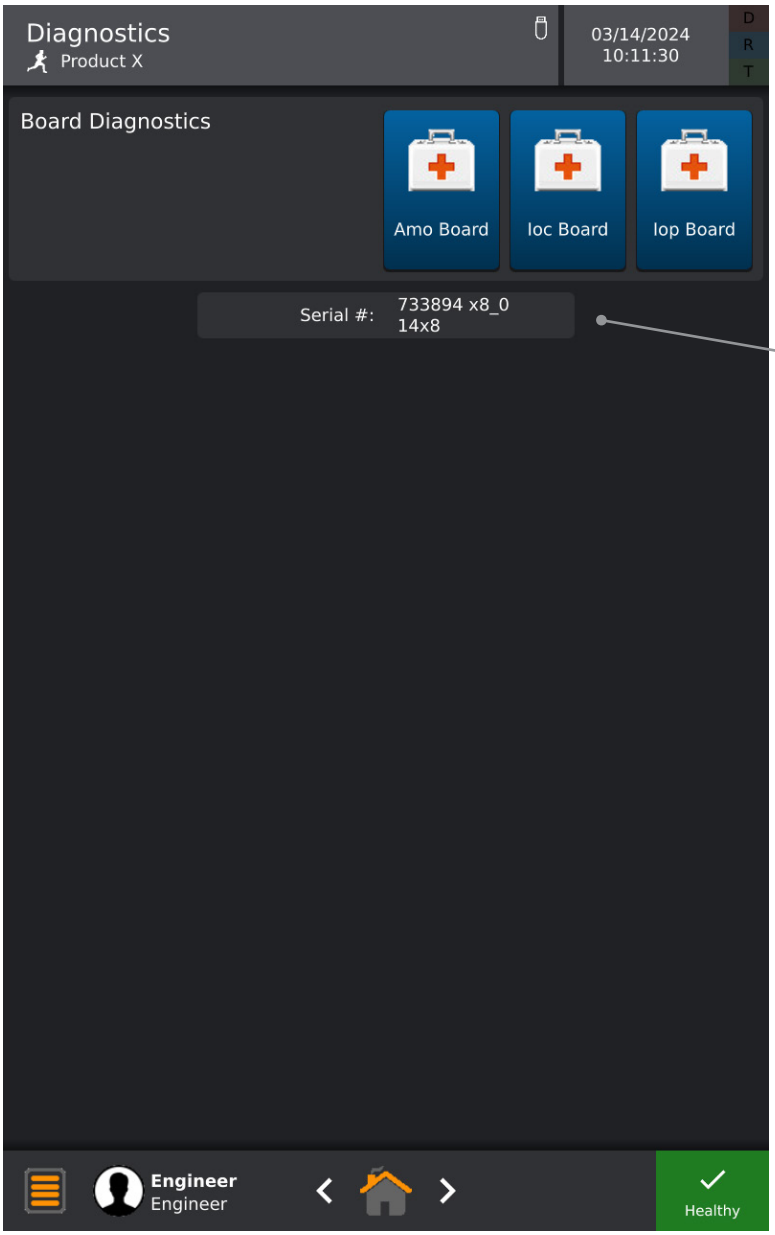
Allows You to Change Your Password

Allows Addition, Deletion, and Changes to Users—Requires at least "QC Level" to View

Allows Adjustment of Date/Time, Screen Brightness, and Password Timeout Requires at least "QC Level" to View

Allows selection of various options that control general operation Requires at least "Engineer Level" to View

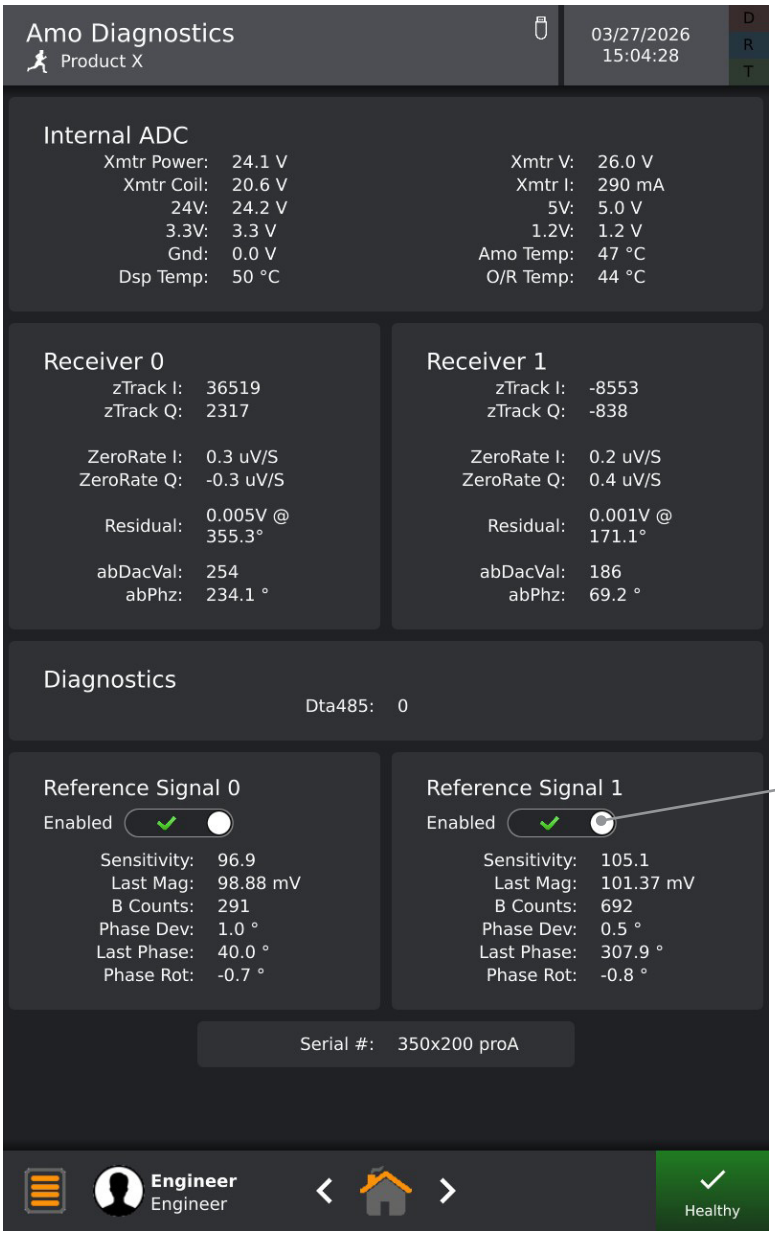
DIAGNOSTIC SCREEN



Troubleshooting Feature for Use with Factory Technician

NOTE: This screen requires at least "Supervisor Level" to view.

AMO DIAGNOSTIC SCREEN



Troubleshooting Feature for Use with Factory Technician Default is ON

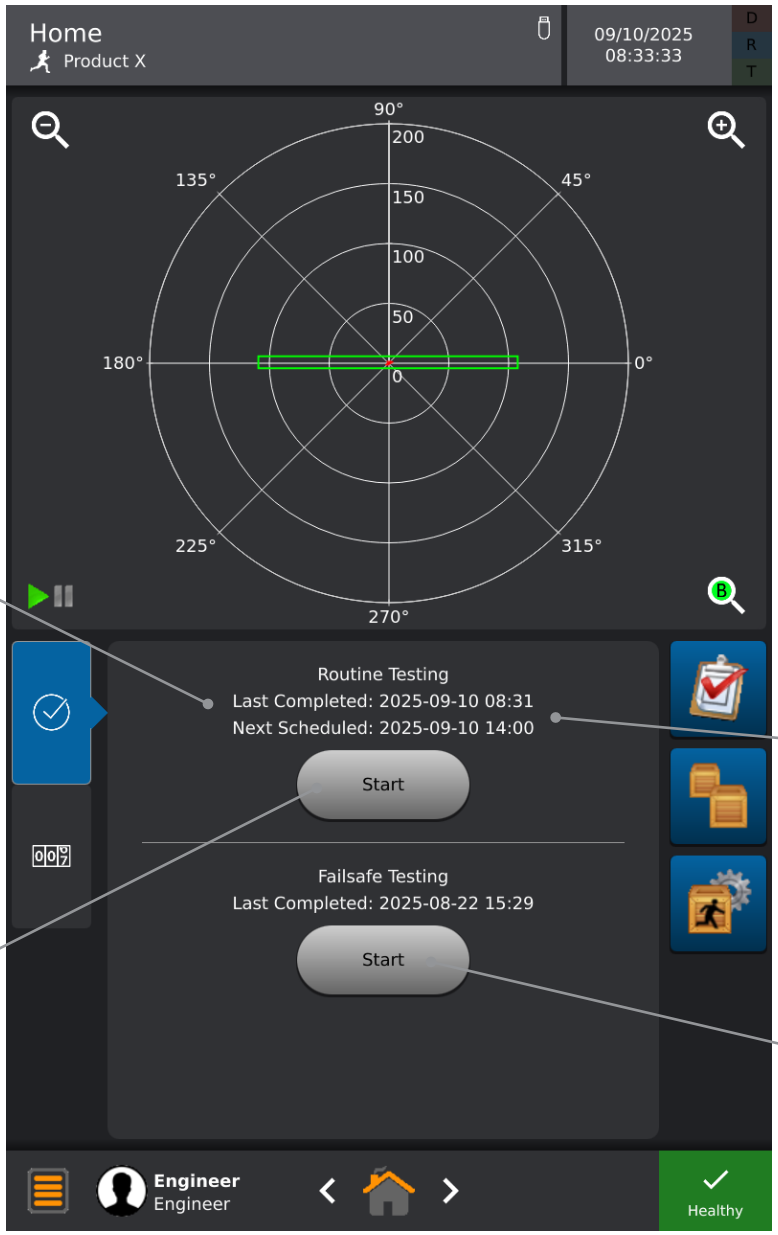
NOTE: This screen requires at least "Supervisor Level" to view.

ABOUT SCREEN

Eriez Contact Information

Current Software Versions and Detector Serial Number

QUALITY CONTROL HOMEPAGE SCREEN



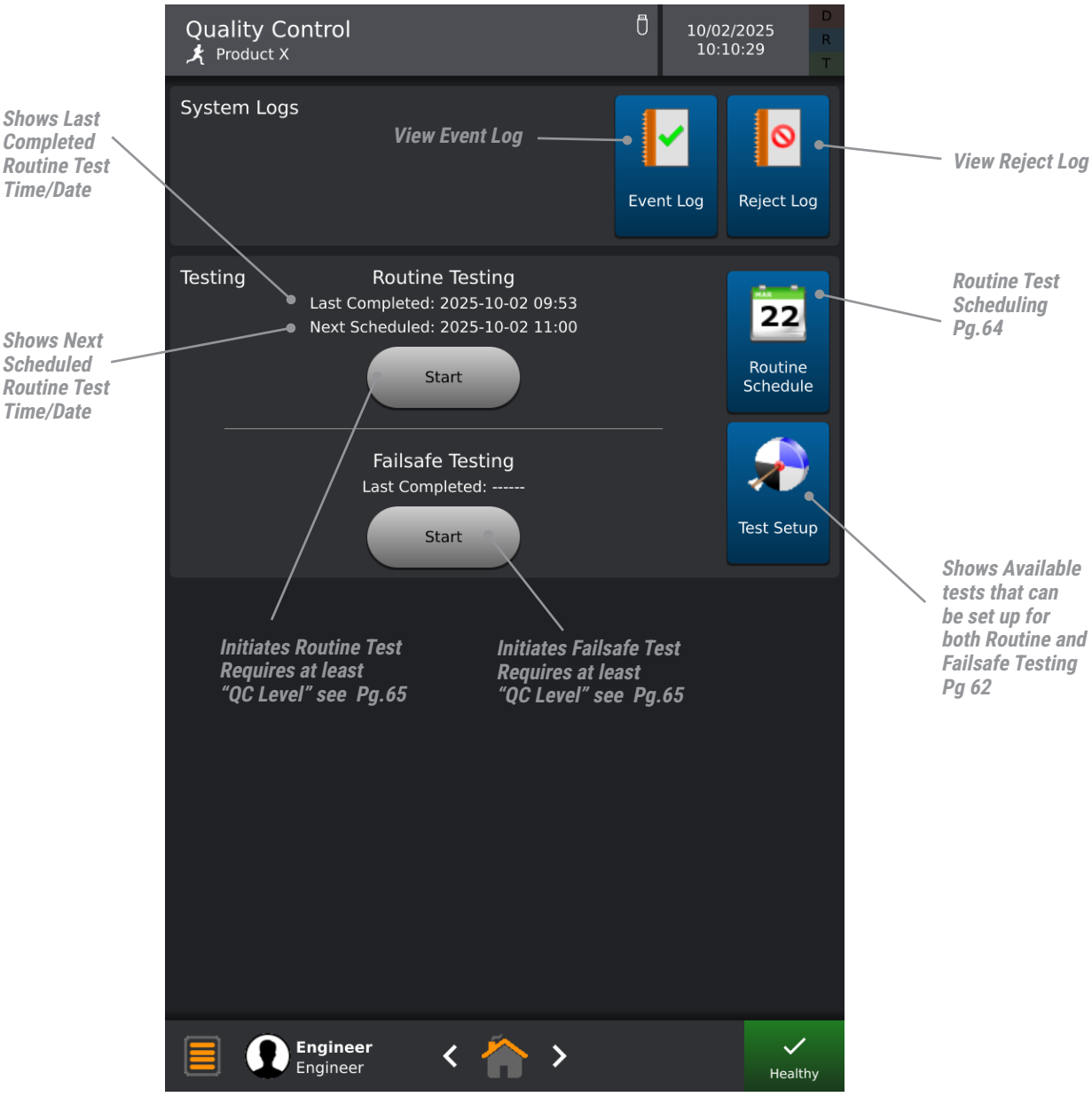
Shows Last Verification Time/Date

Shows Next Scheduled Verification Time/Date

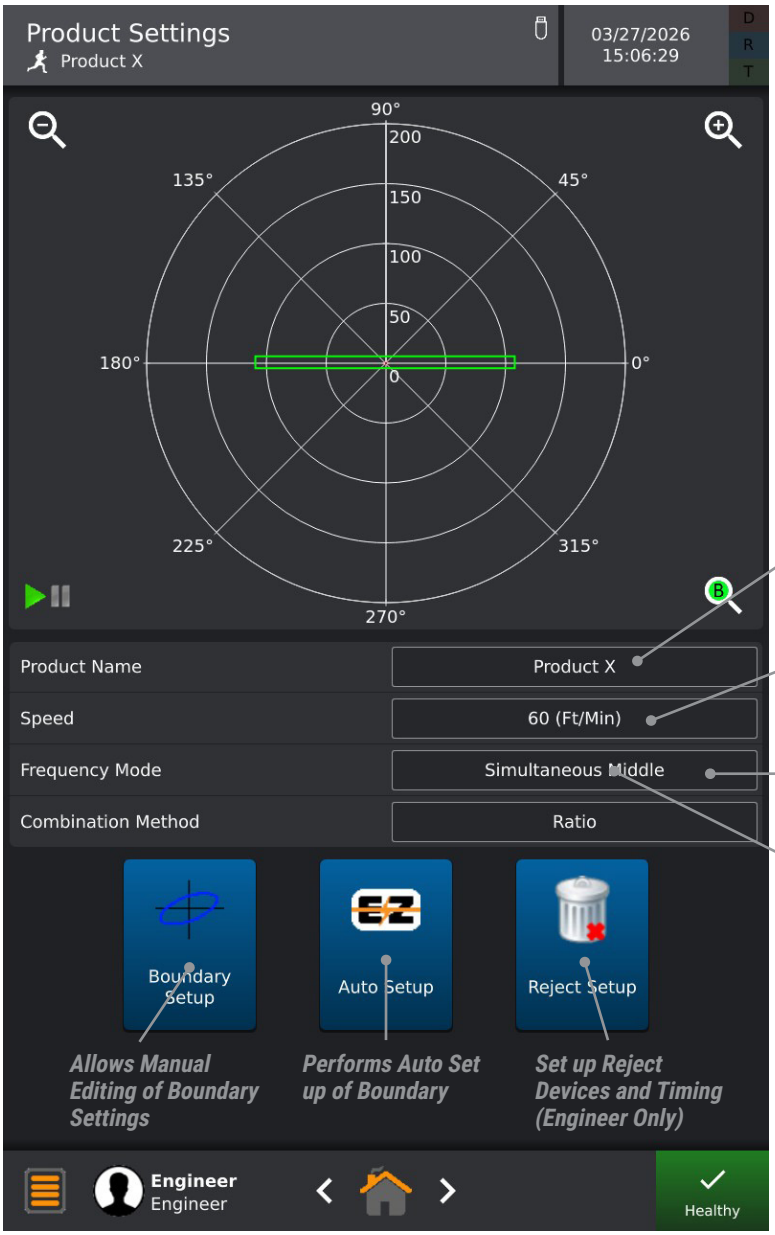
Initiates Routine Test Requires at least "QC Level" see Pg.65

Initiates Failsafe Test Requires at least "QC Level"

QUALITY CONTROL SCREEN

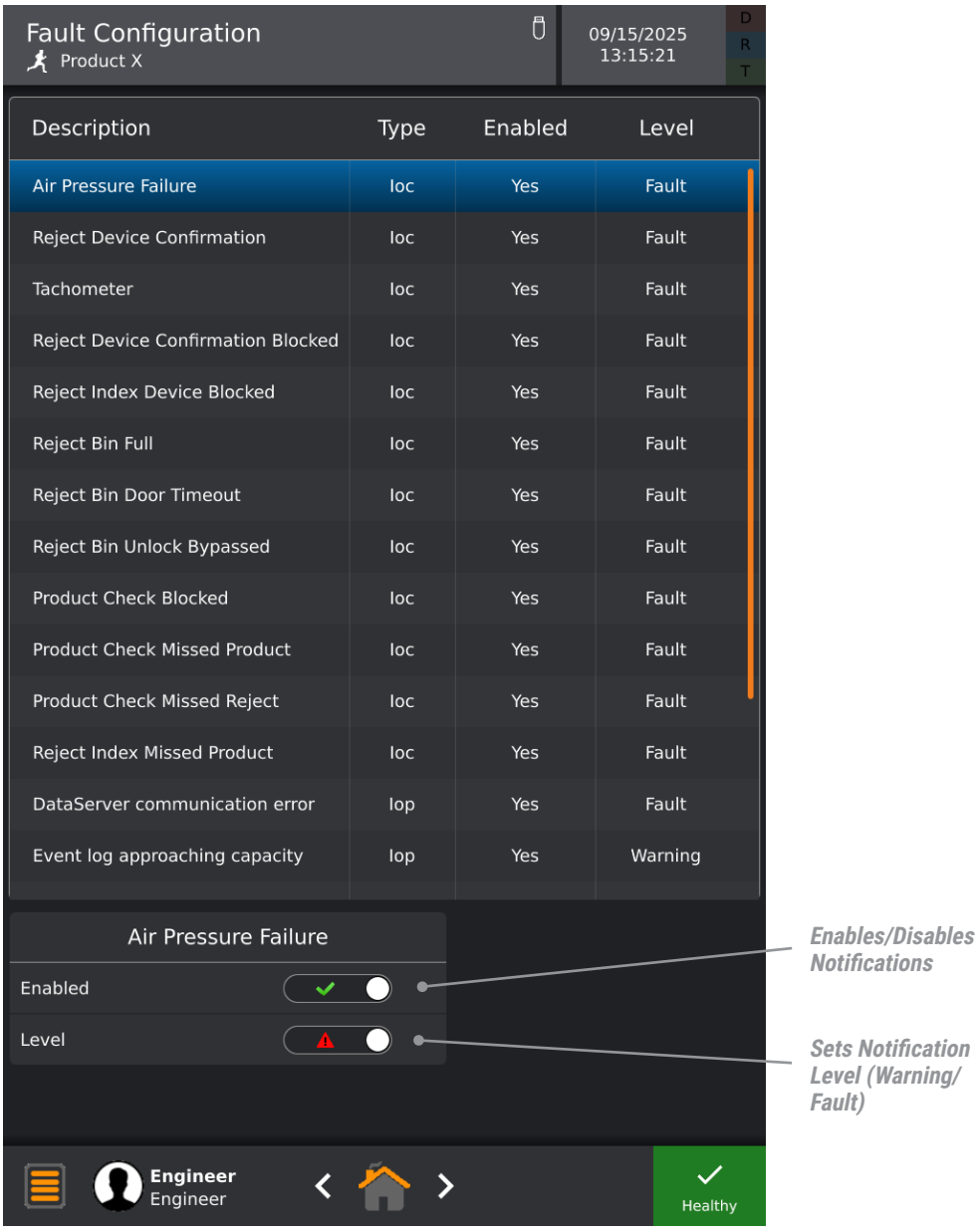


PRODUCT SETTINGS



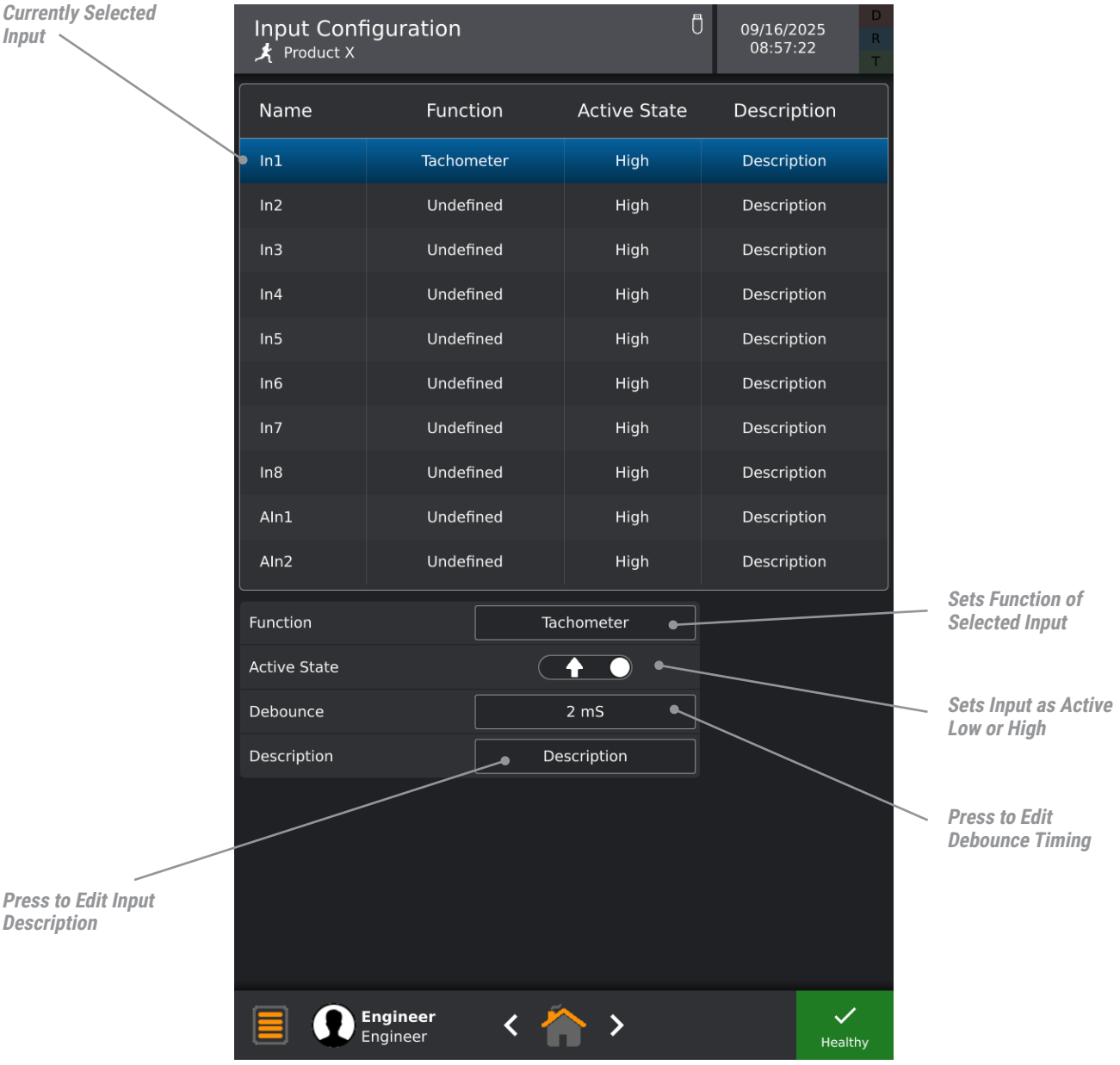
NOTE: This screen requires at least "Supervisor Level" to view. Some features of this page require "Engineer Level."

FAULT CONFIGURATION



NOTE: This screen requires “Engineer Level” to view.

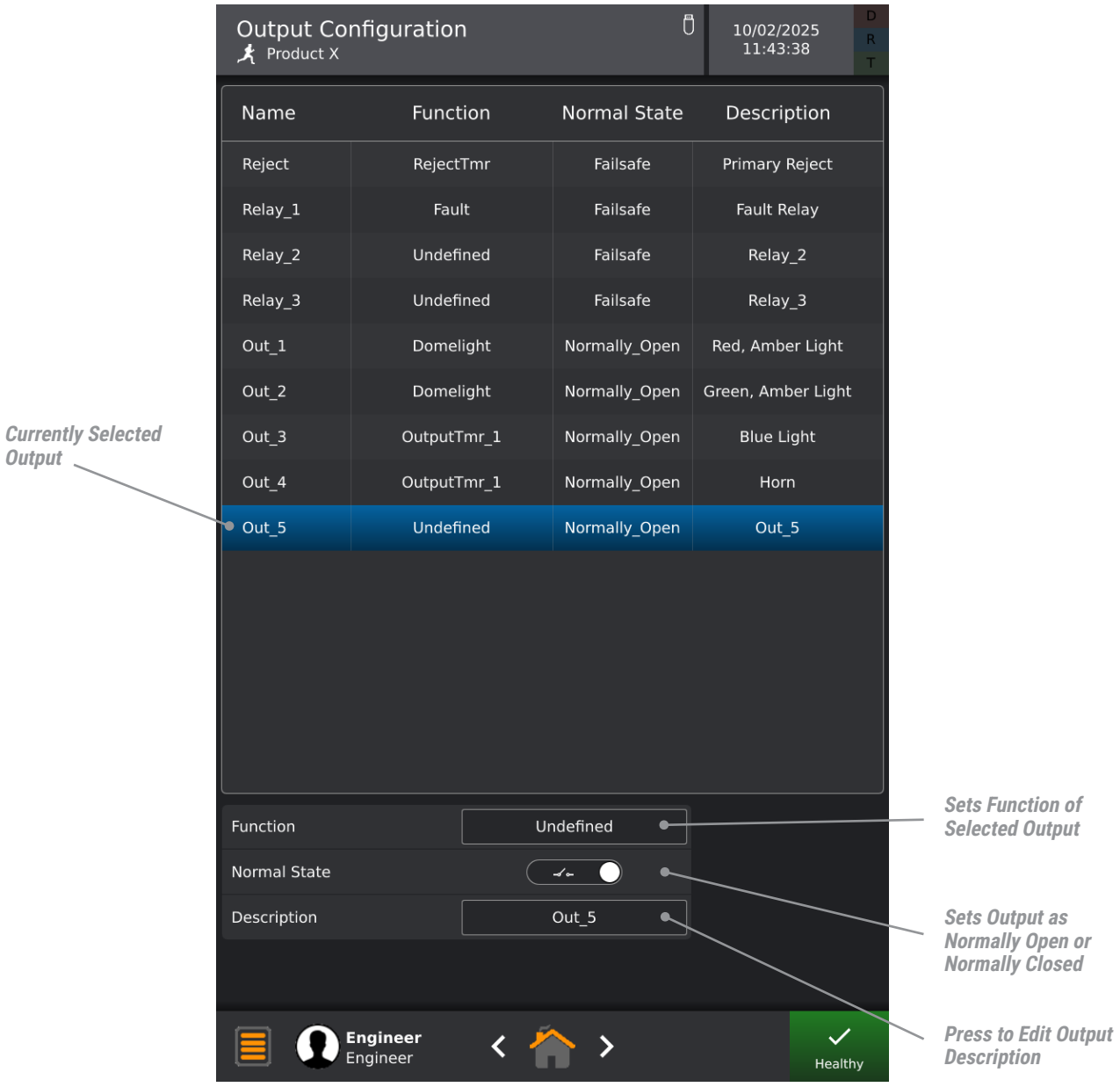
INPUT CONFIGURATION SCREEN



"Ain1 and Ain2" functionality is limited to "Air Pressure Failure" or "Reject Bin Door" only.

NOTE: This screen requires "Engineer Level" to view.

OUTPUT CONFIGURATION



"Reject and Relay_1-3" can only have failsafe as a "Normal State".

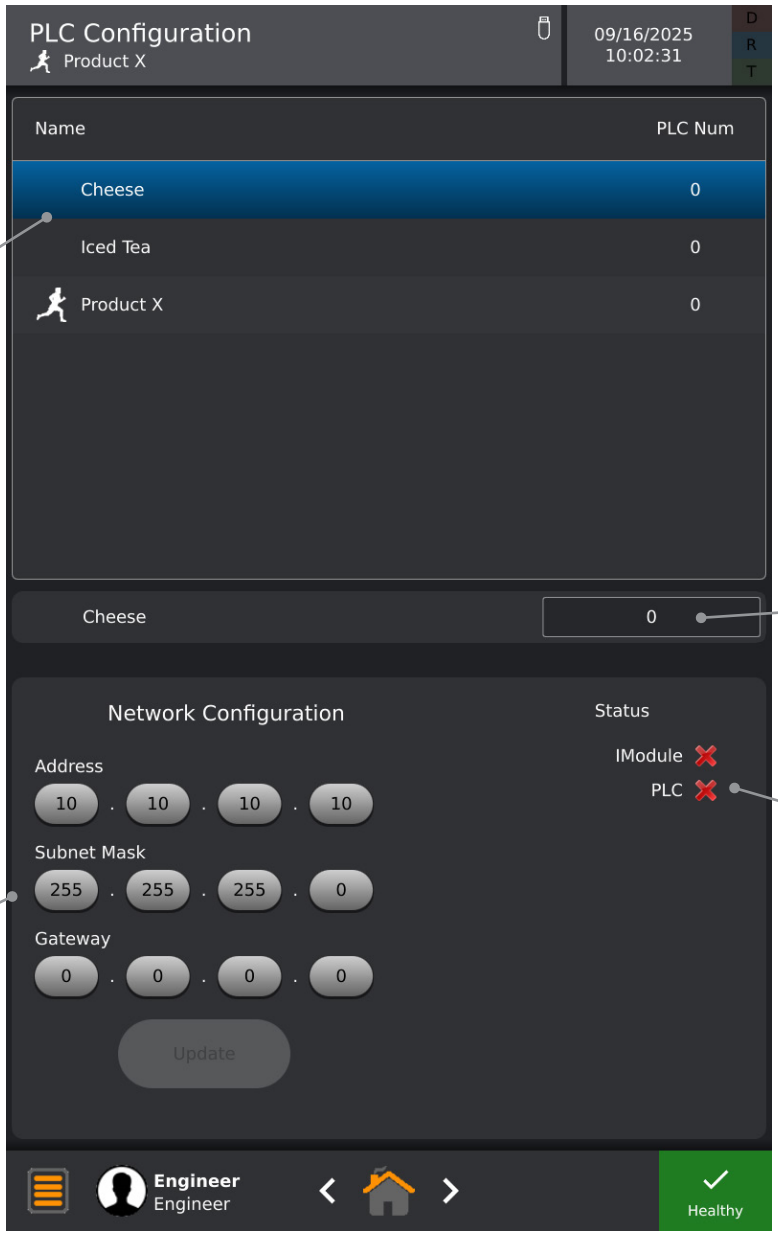
"Reject" functionality is limited to "Reject Timer" or "Overhead A-B."

NOTE: This screen requires "Engineer Level" to view.

NETWORK CONFIGURATION

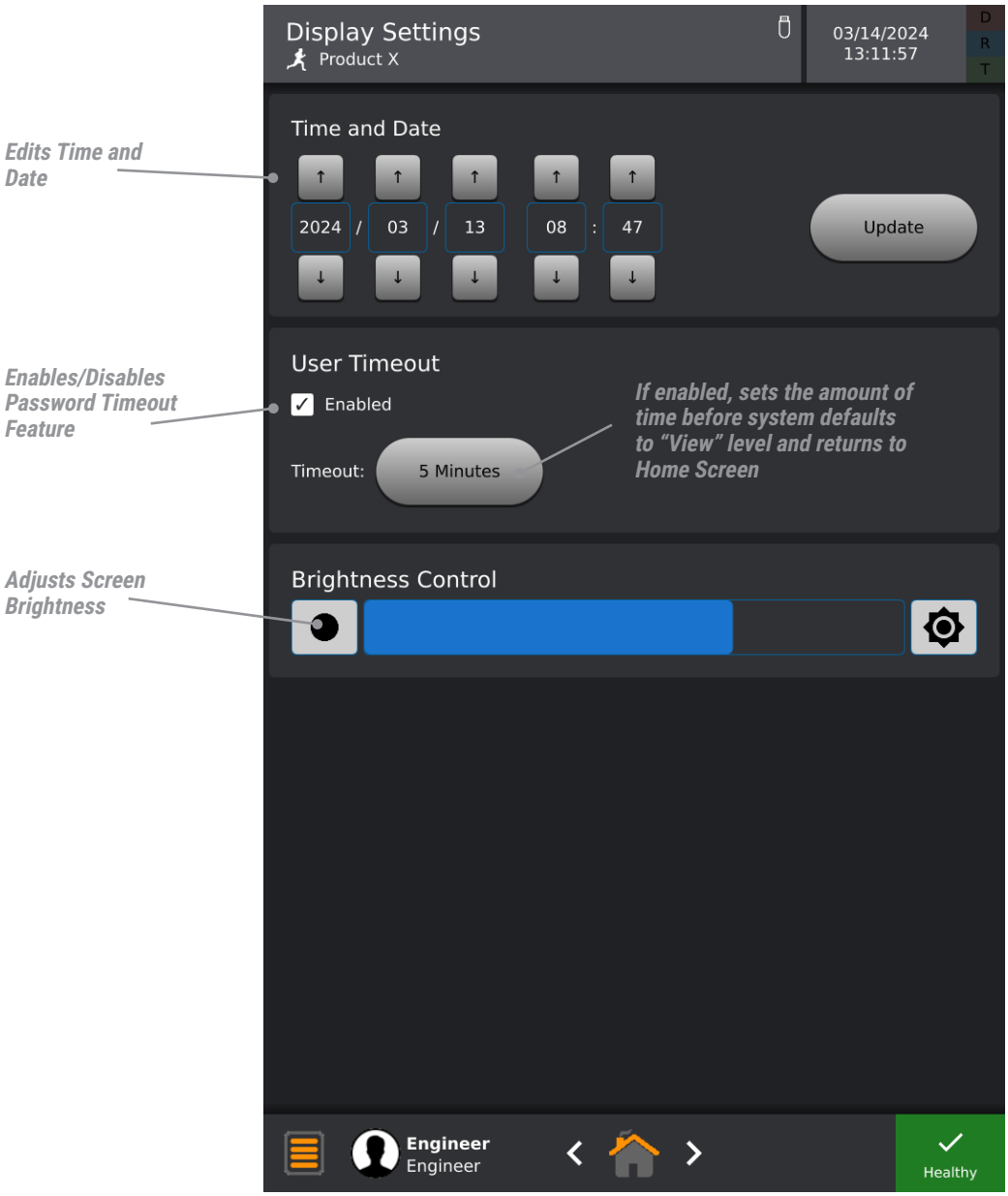
NOTE: This screen requires "Engineer Level" to view.

PLC CONFIGURATION



NOTE: This screen requires "Engineer Level" to view.

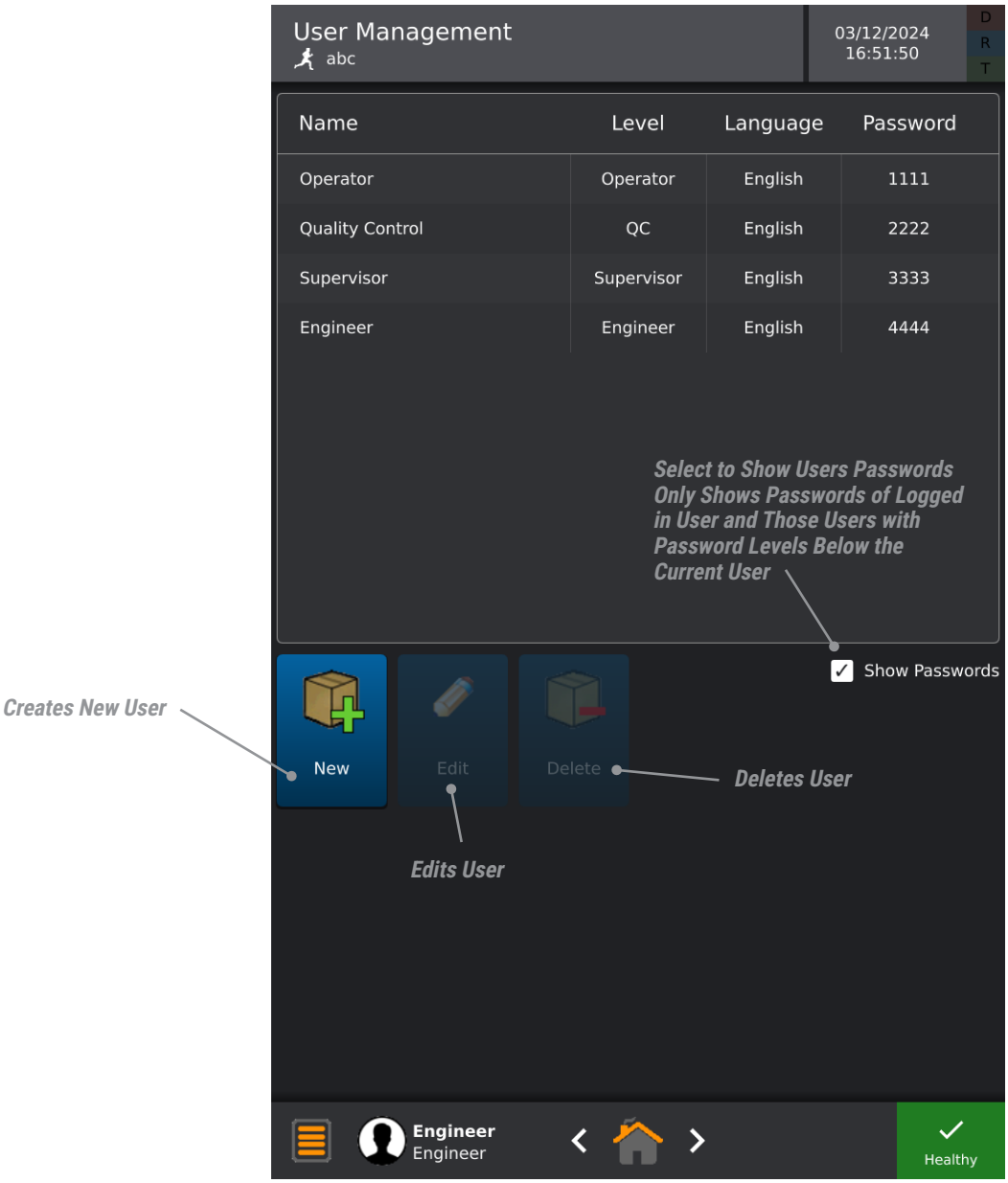
DISPLAY SETTINGS



NOTE: Time is set using a 24-hour clock.

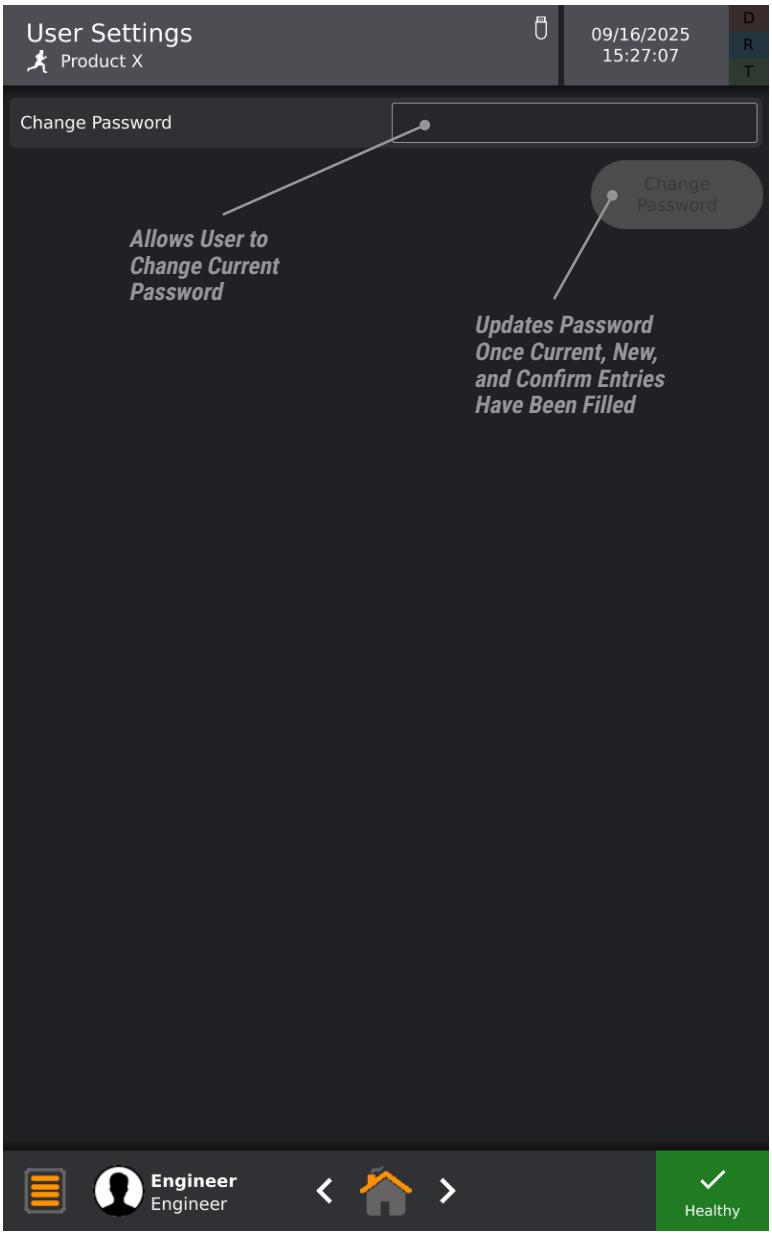
NOTE: This screen requires at least "QC Level" to view.

USER MANAGEMENT

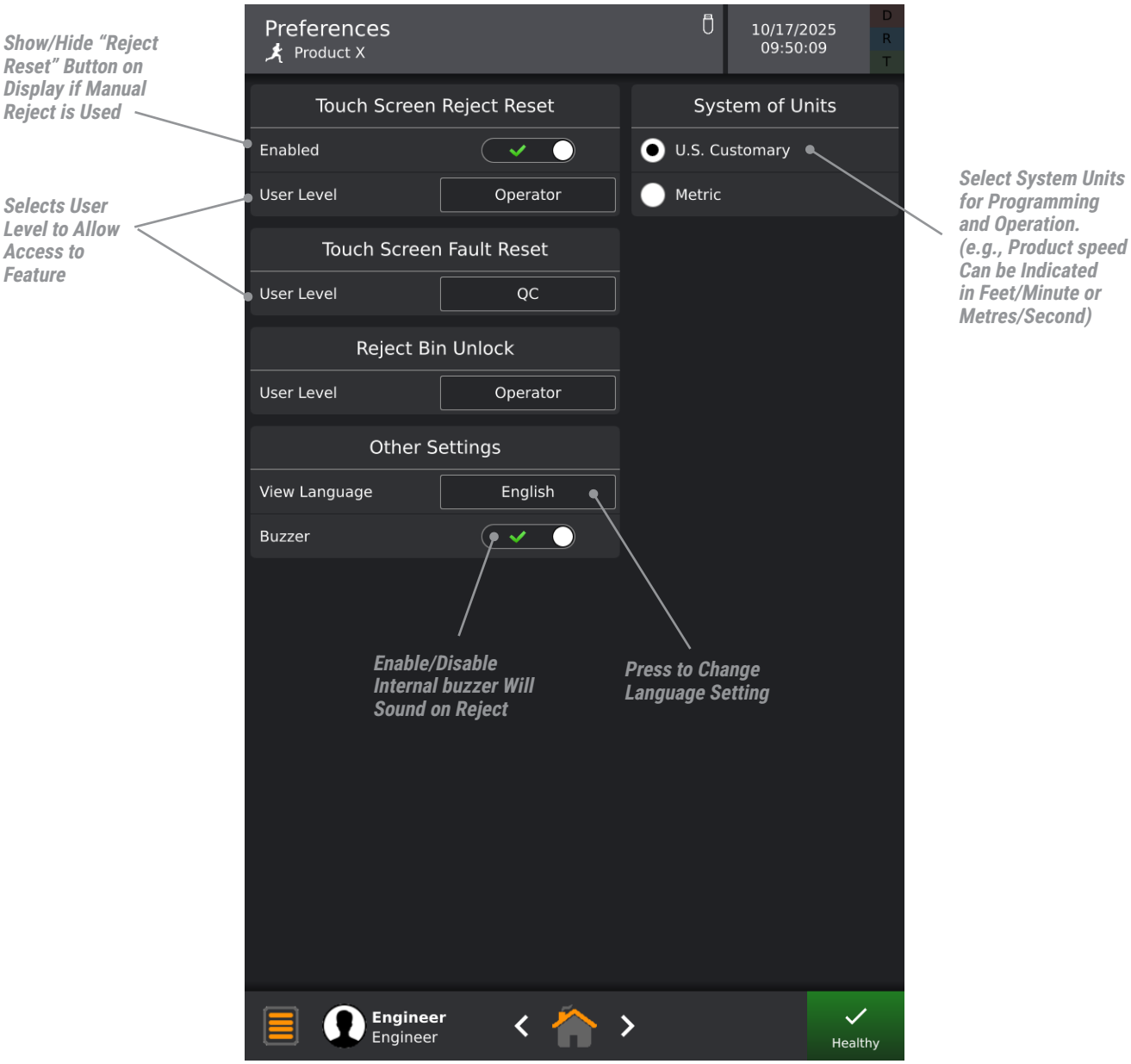


NOTE: A user may Create or Delete users at their level and below. A user may Edit their own information or users below their level.

NOTE: This screen requires at least "QC Level" to view.

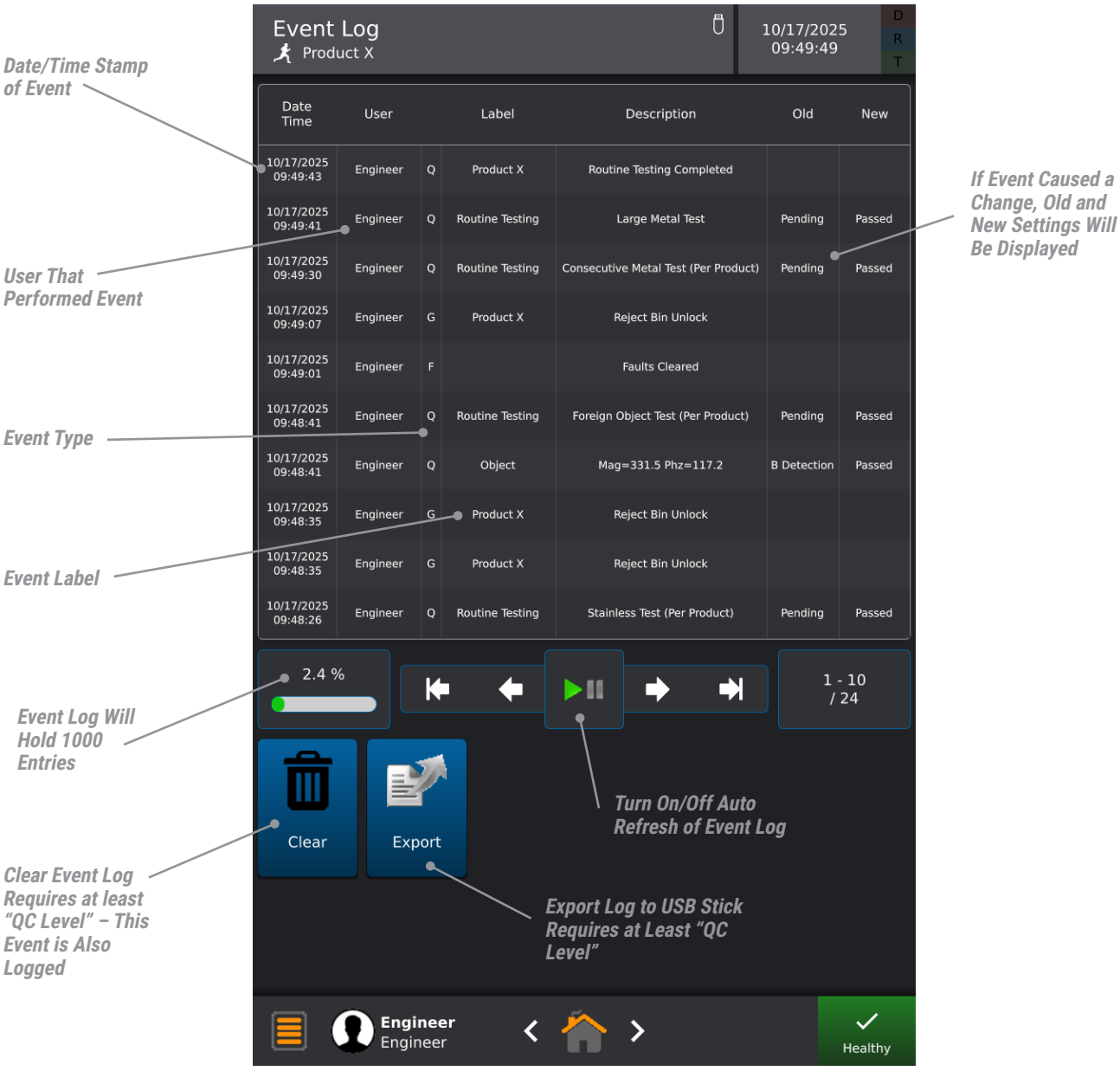

User Settings
Product X
09/16/2025
15:27:07
D
R
T
Change Password
Change Password
Allows User to Change Current Password
Updates Password Once Current, New, and Confirm Entries Have Been Filled
Engineer
Engineer
Healthy

PREFERENCES



NOTE: This screen requires at least "Engineer Level" to view.

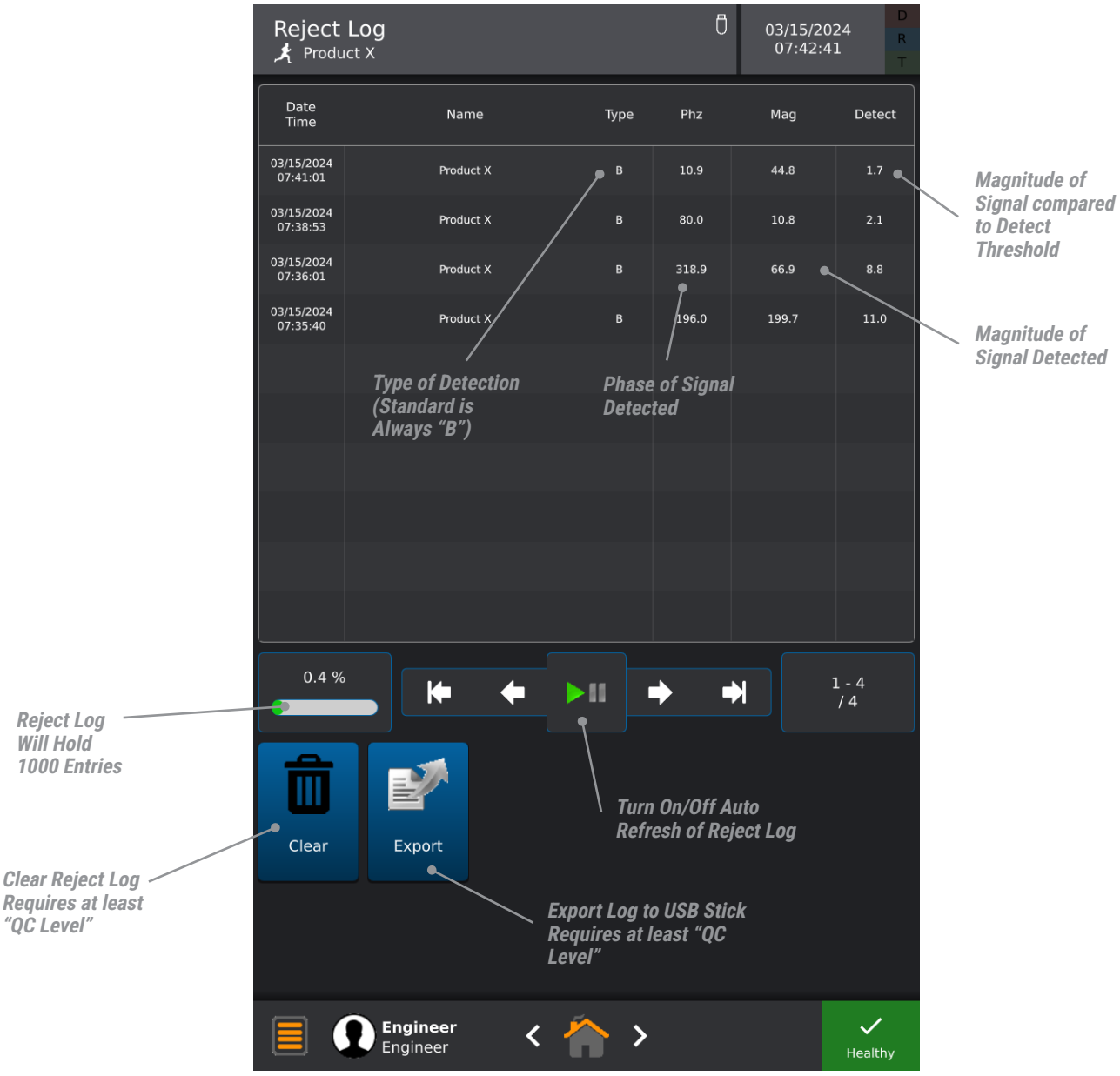
EVENT LOG SCREEN



Event Type Nomenclature

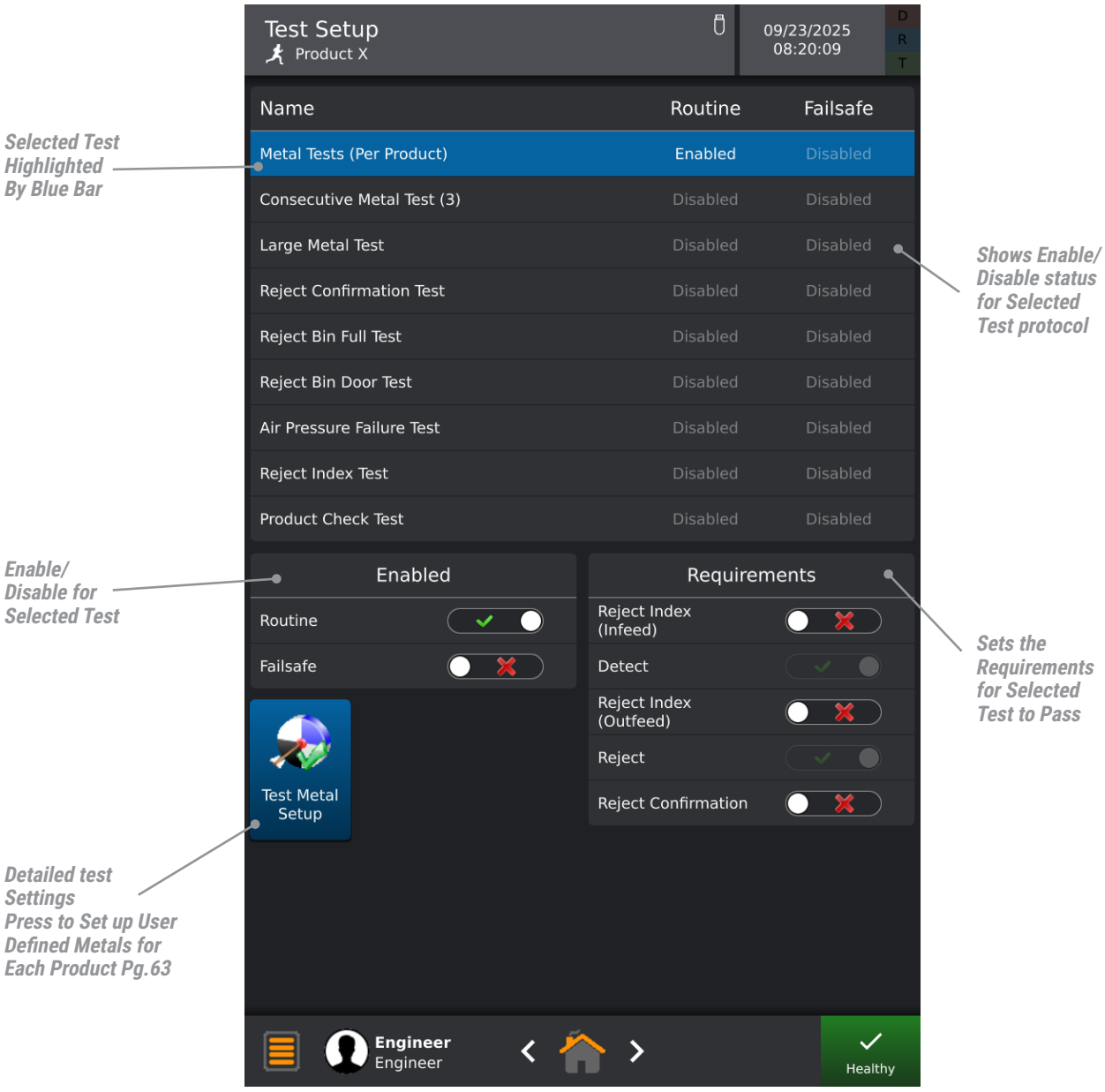
G: General P: Parameter Q: Quality F: Fault

REJECT LOG SCREEN



Type of Detection Nomenclature

B: Boundary B_EP: Boundary & Enhanced Platform EP: Enhanced Platform EP_B: Enhanced Platform & Boundary



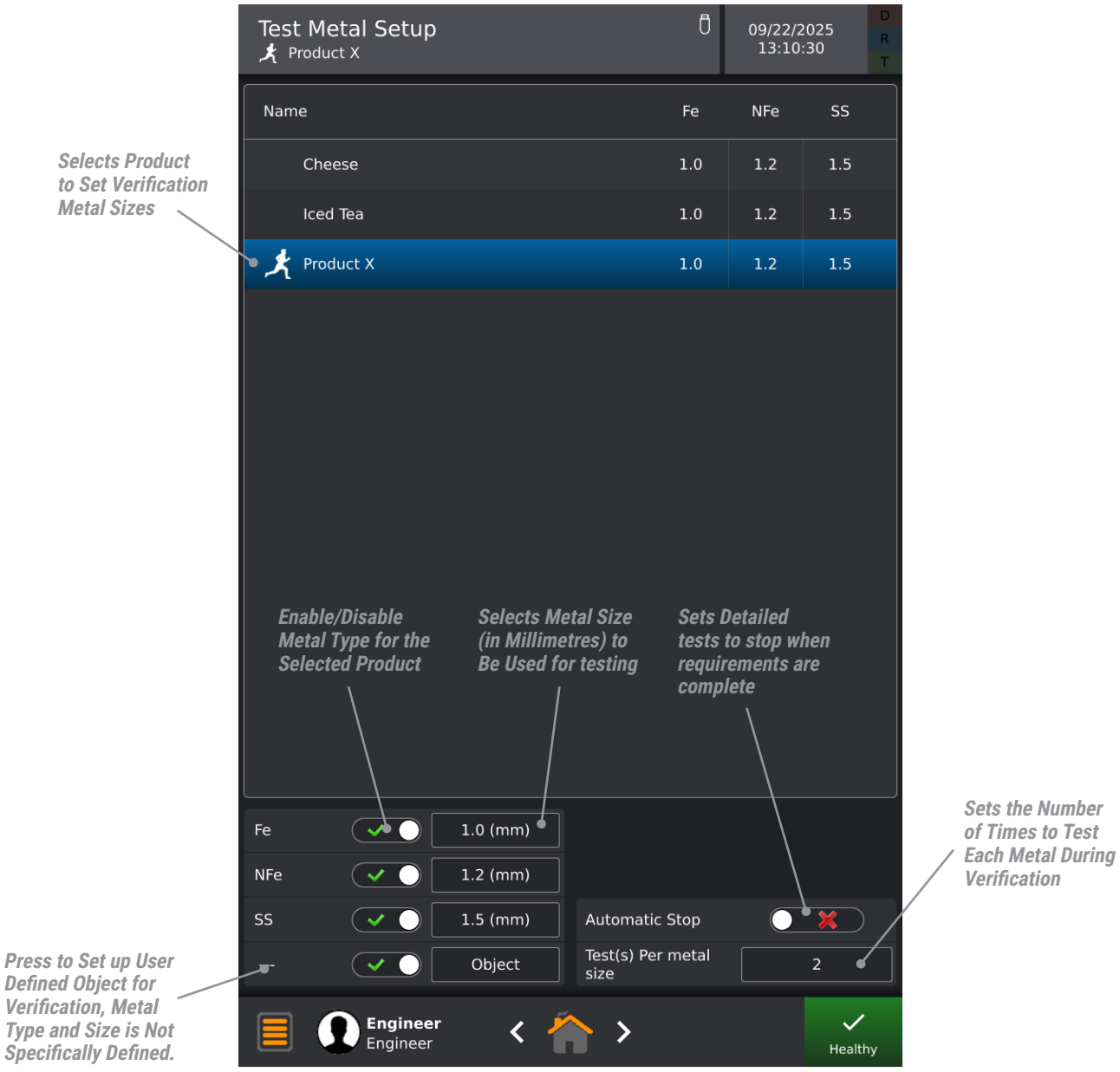
Routine Testing: Schedule Based - Failsafe Testing: Beginning / End of a Shift

NOTE: Only "Metal Test (Per Product)" is Enabled by default.

NOTE: Only Routine testing can be set up on a schedule.

NOTE: This screen requires at least "QC Level" to view.

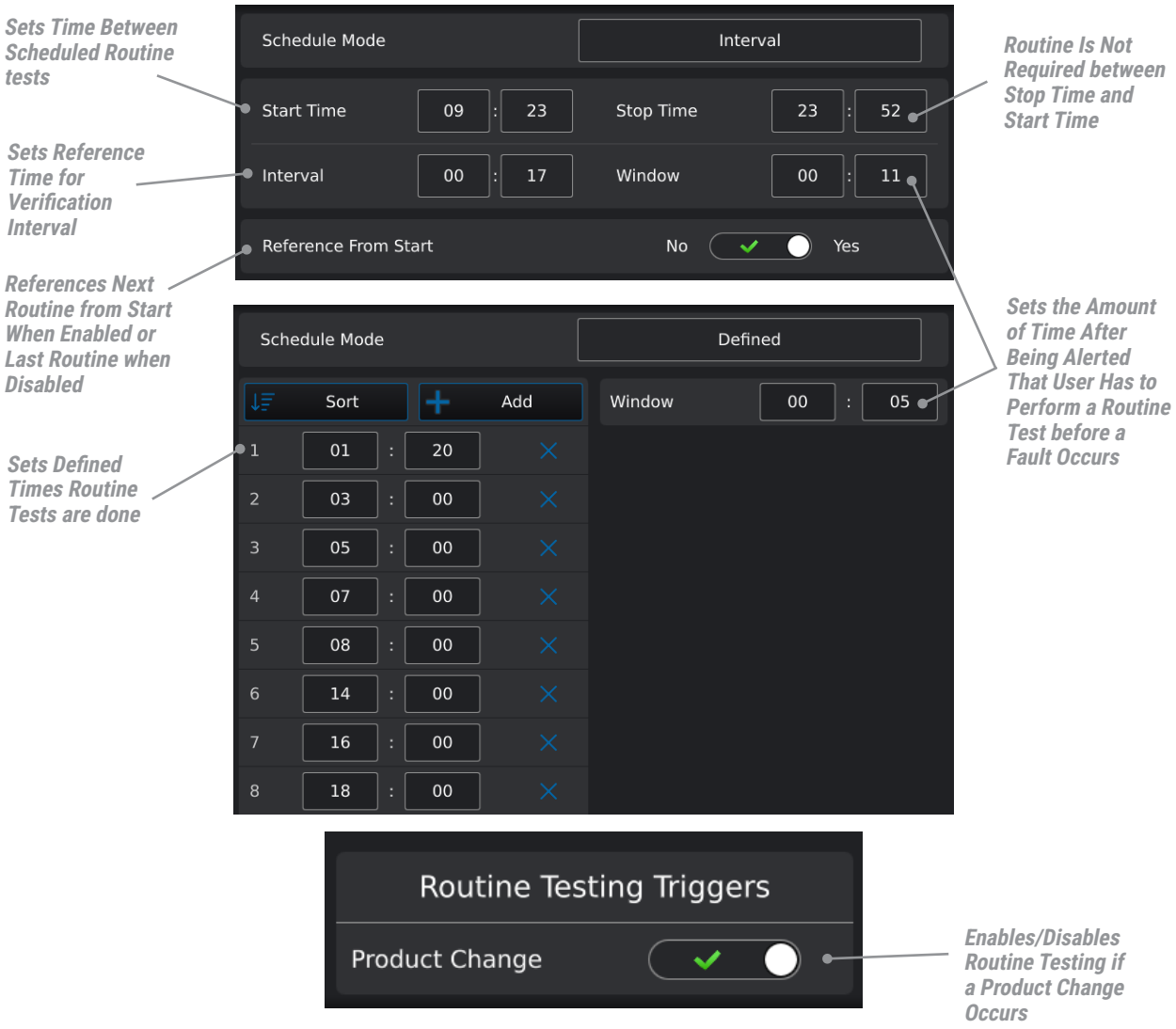
TEST METAL SETUP



NOTE: This screen requires at least "QC Level" to view.

ROUTINE SCHEDULE

NOTE: The window opens the set number of time prior to the next verification check and closes at the time when the verification check is overdue. A warning will be displayed when the window opens and a fault when it closes if the Routine test was not completed.

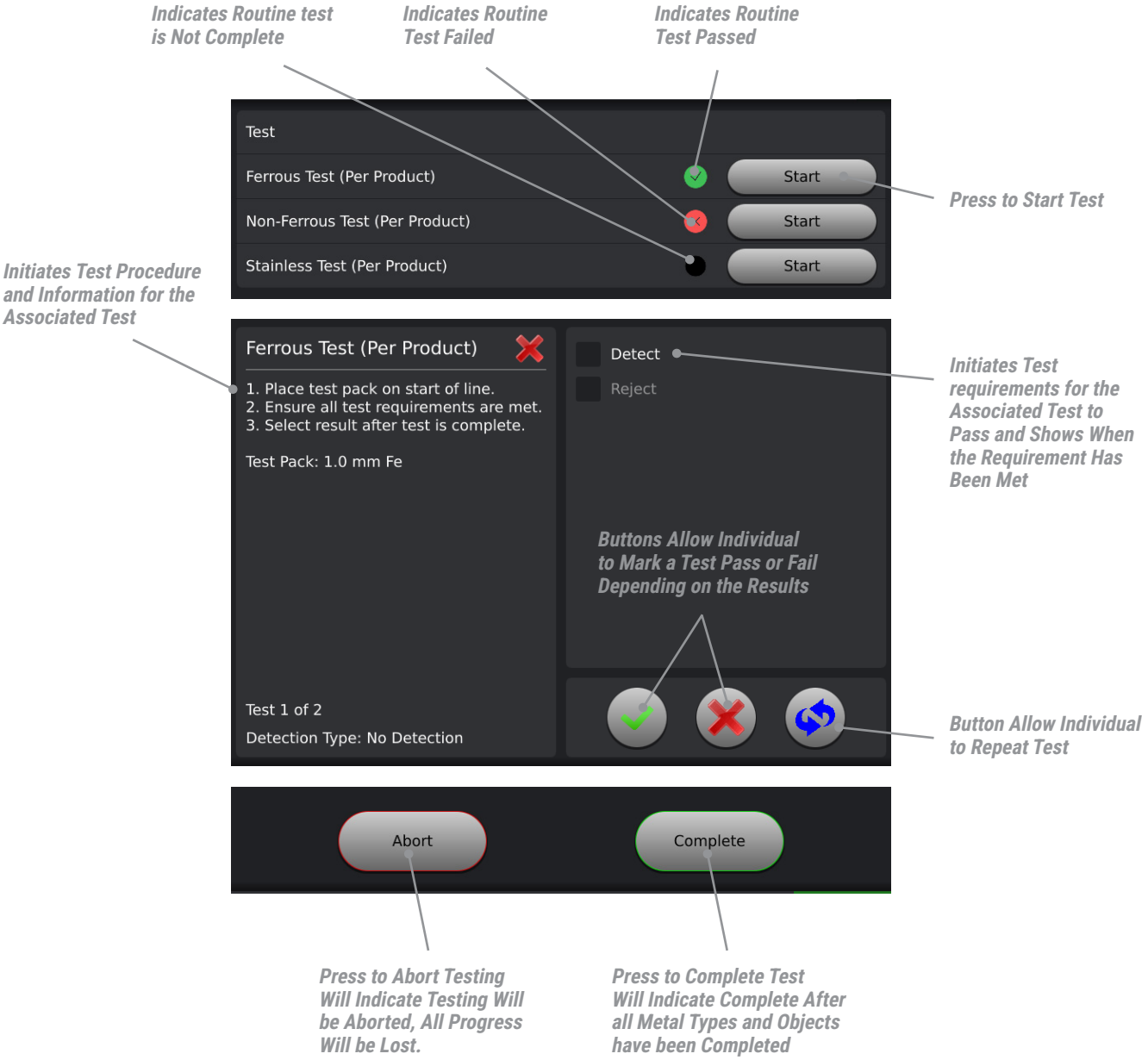


If your company runs 24/7 it is recommended that you set the start time to 00:01 and the stop time to 23:59.

NOTE: Only one "Schedule Mode" can be selected at a given time.

NOTE: This screen requires at least "QC Level" to view.

ROUTINE TESTING SCREENS



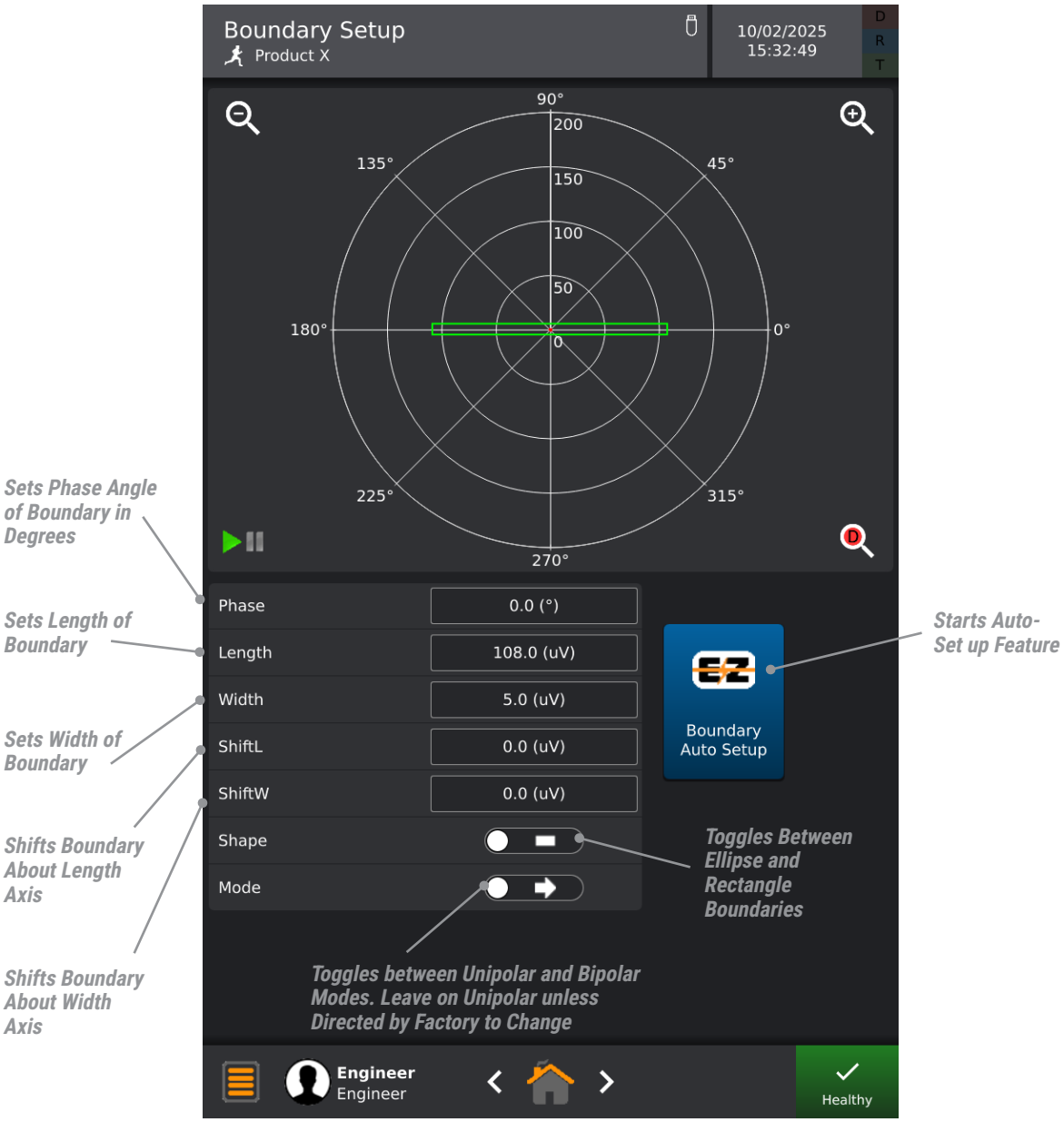
NOTE: Examples above are in-progress test situations. not all situations or tests are shown.

NOTE: Some tests require specific inputs to be set up to complete some test requirements. See pg.83 Input configuration

NOTE: These screens requires at least "QC Level" to view.

BOUNDARY SETUP

Detection Boundary Explained Pg.91



NOTE: This screen requires at least “Supervisor Level” to view.

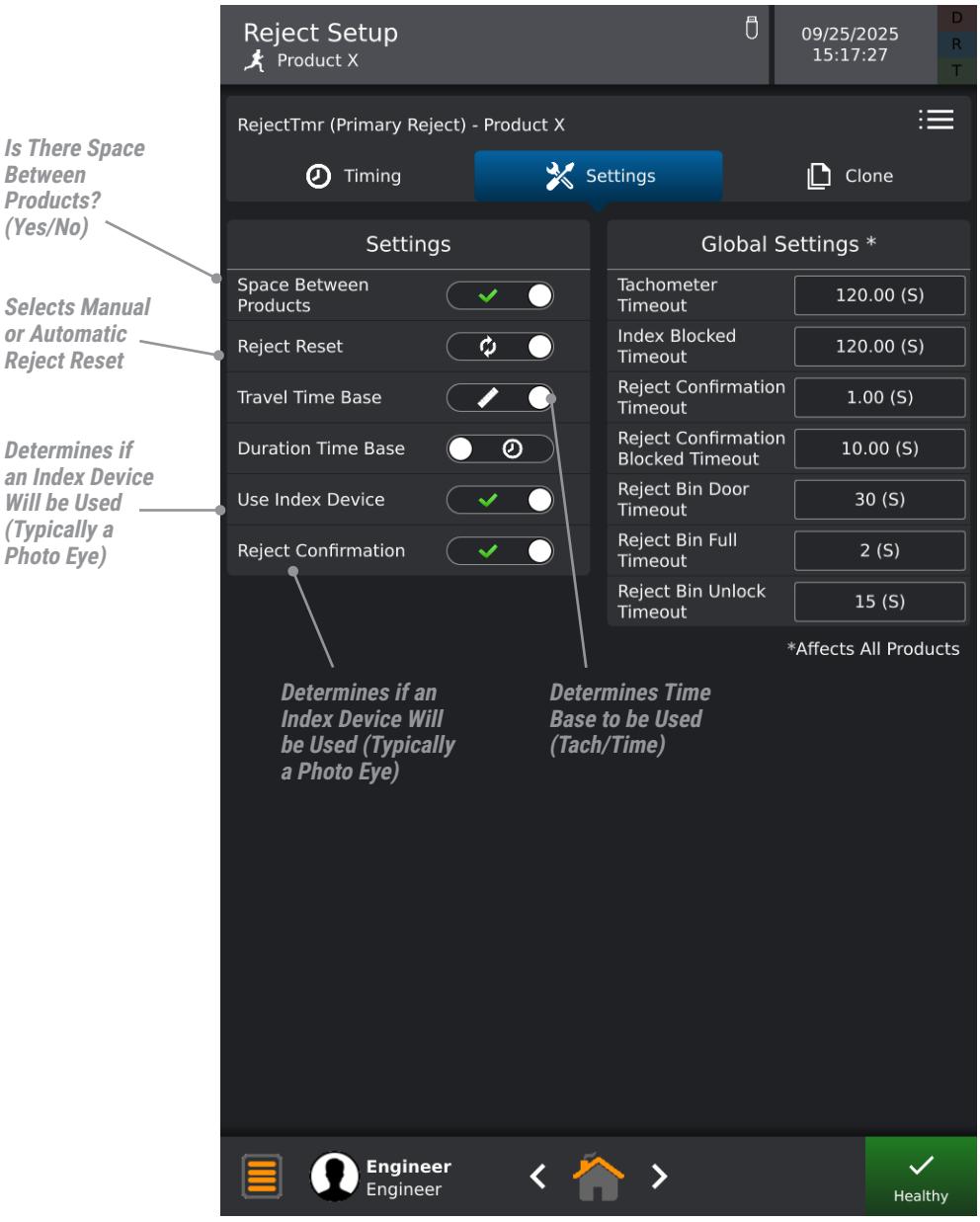
REJECT SETUP

NOTE: Not all options are available by default and are based on input configuration pg. 83

NOTE: Duration Off Time is normally only used for Pusher Arm type reject devices.

NOTE: This screen requires "Engineer Level" to view.

ADVANCED REJECT SETUP



NOTE: This screen requires "Engineer Level" to view.

NOTE: Not all options are available by default and are based on input configuration pg. 83

PRODUCT

- New Product Wizard Pg.70 — E
- Clone a Product Pg.71 — E
- Rename Product Pg.72 — S
- Setup Product Boundary Pg.73 — S
- Change/ Run a Product Pg.74 — O
- Edit Product Settings Pg.75 — E
- Edit Product Speed Pg.76 — E
- Setup Reject Timing Pg.77 — E
- Copy Timer Settings Pg.78 — E
- Perform a Backup Pg.79 — E

USER

- Setup New User Pg.80 — Q
- Switch Users Pg.81 — O

I/O

- Setup Output Device Pg.82 — E
- Setup Input Device Pg.83 — E
- Setup Product Counting Pg.84 — E
- Setup Reject Device Pg.85 — E
- Setup Conveyor Running Pg.87 — E
- Setup Input / Output Follower Pg.87 — E

QC

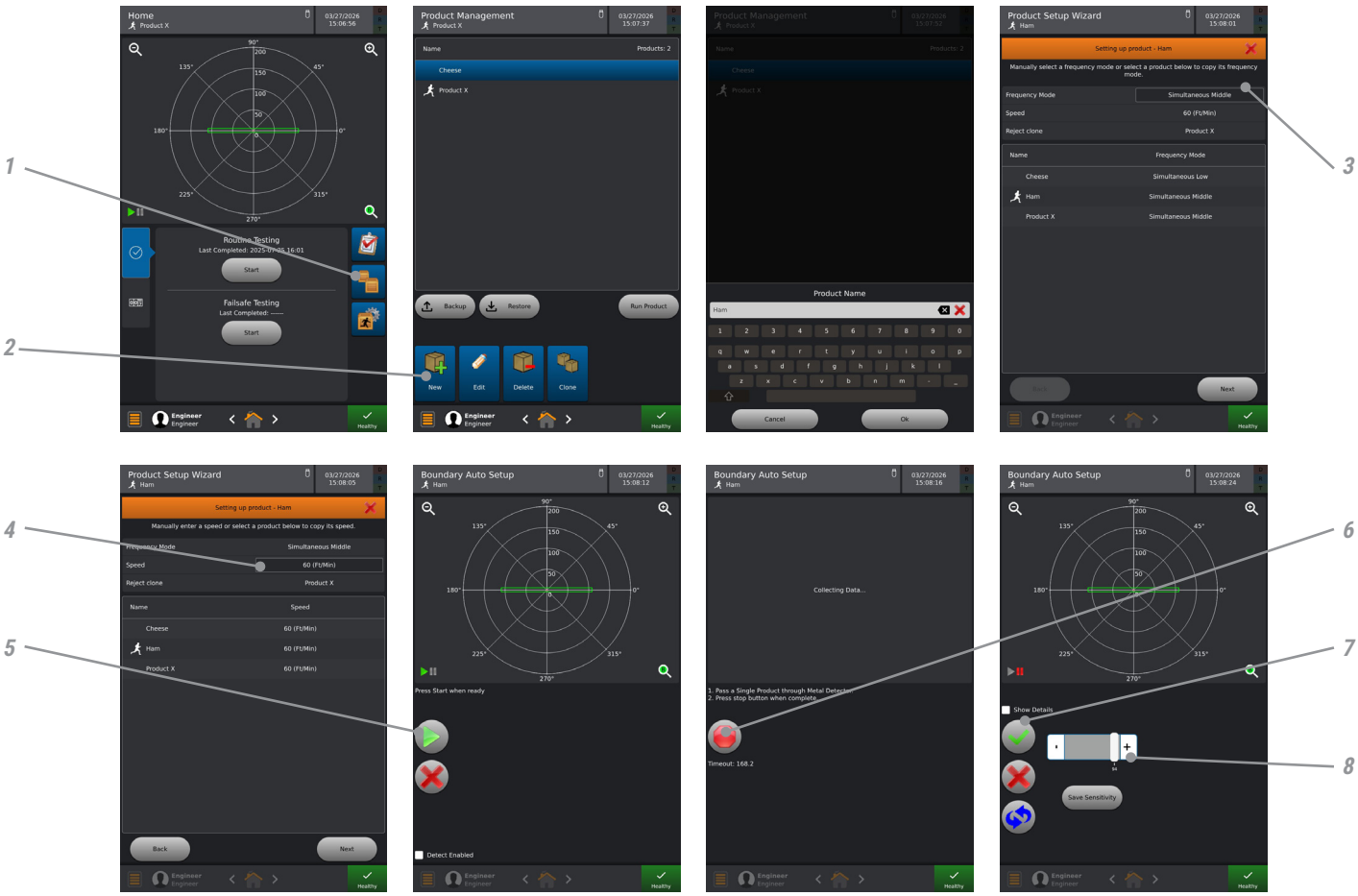
- Perform Verification Check Pg.86 — Q
- Export Report Logs Pg.89 — Q

Detection Boundary Explained Pg.91

PASSWORD LEVEL HIERARCHY
E – Engineer = 4444
S – Supervisor = 3333
Q – Quality Control = 2222
O – Operator = 1111

NOTE: Symbol in upper right corner denotes minimum password level required to perform that operation.

“HOW TO” RUN NEW PRODUCT WIZARD

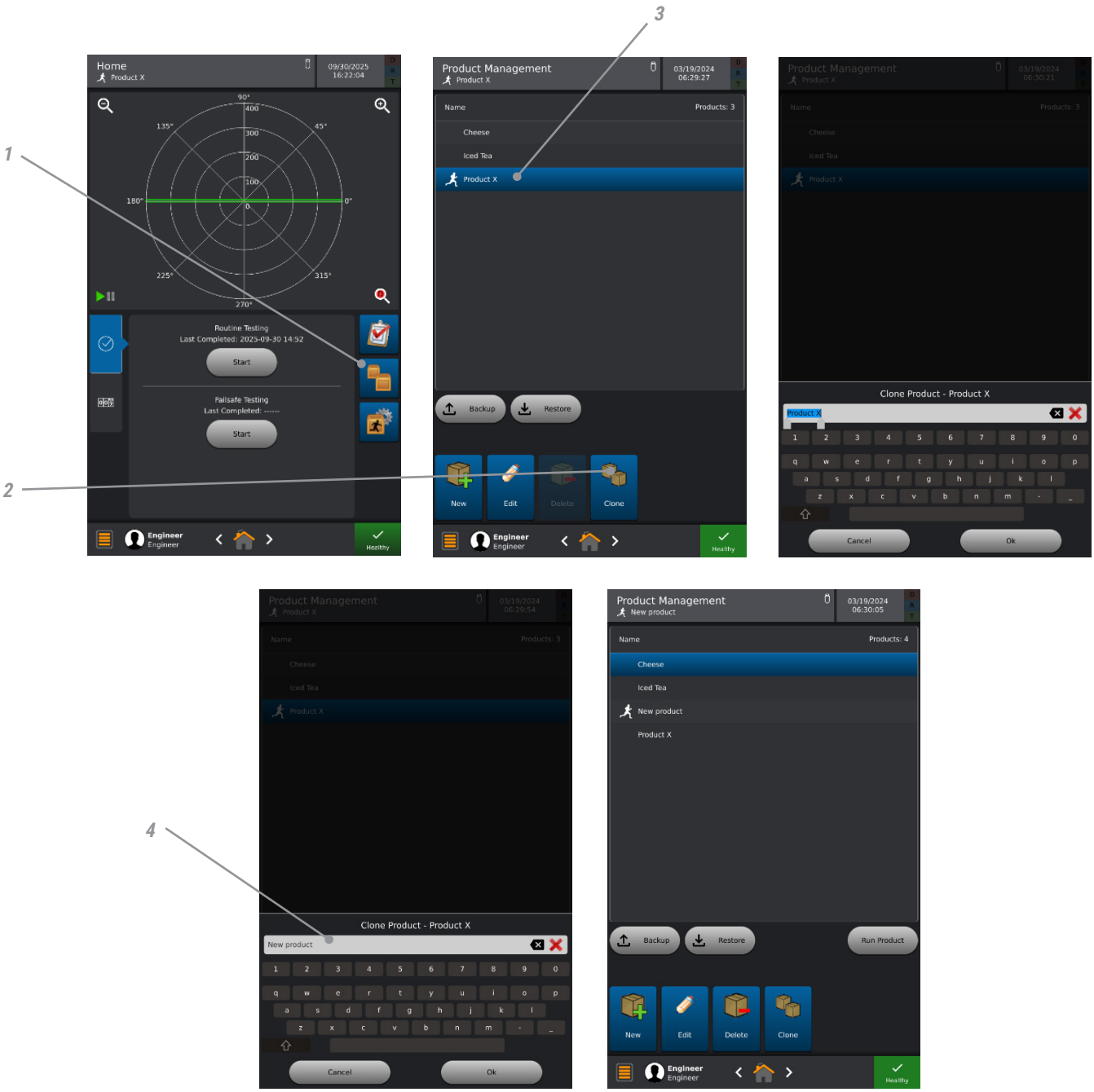


Ensure the belt is running and the product you are setting up is nearby.

1. From the “Home Screen” press “Product Setup."
2. Press “New” and rename your product.
3. Select Frequency Mode or copy from the list below.
4. Select Speed or copy from the list below. Note: this also copies that product’s reject settings.
5. Press Start and pass a single product.
6. Press Stop after product has passed through the tunnel.
7. If the settings are acceptable, select the “Green Check Box." If you wish to be more aggressive or conservative with the sensitivities, see step 8.
8. The sensitivity slider is set to 94 as the default. In most cases, no adjustment is necessary to achieve desired sensitivity levels. The sensitivity slider increases to a maximum of 100 and a minimum of 0.

NOTE: The “Save Sensitivity” button under the sensitivity level allows you to save the current setting as the sensitivity default, should the need arise.

“HOW TO” CLONE A PRODUCT

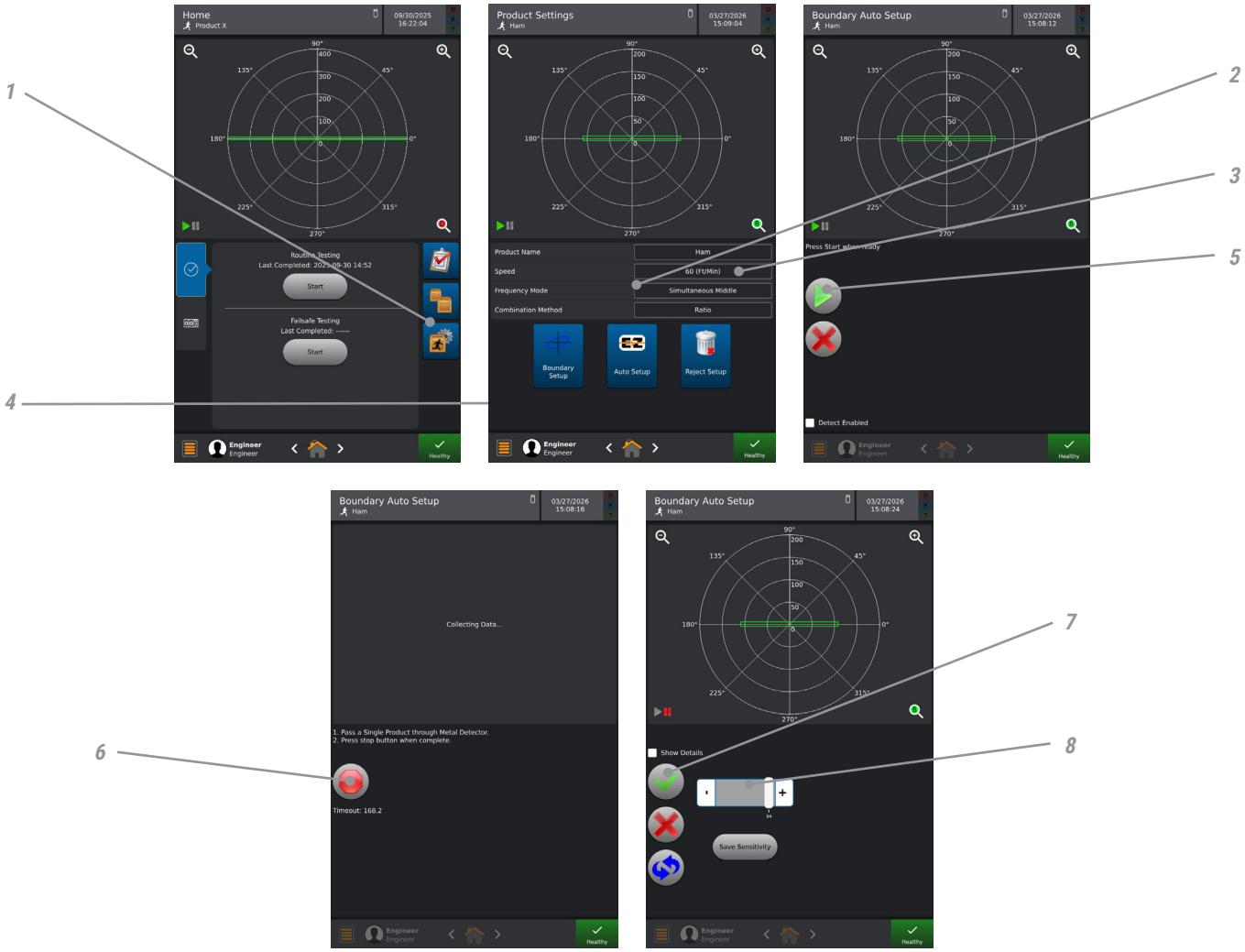


1. From the Home Screen press “Product Setup."
2. Press "Clone".
3. Select Product from the list on the left to clone. Once selected, it will be visible under “Current Product Selection." Press “OK."
4. Rename your new product and it will display in the Product Name list. (See “How To” Rename a Product on the following page)

“HOW TO” RENAME A PRODUCT

1. From the “Product Setup” Screen select the product you wish to edit and press “Edit."
2. Press the name of the product at the top of the table to rename the product.
3. Rename the product using the keyboard and press “OK."
4. The new product name will display in the table.

“HOW TO” SETUP A PRODUCT BOUNDARY

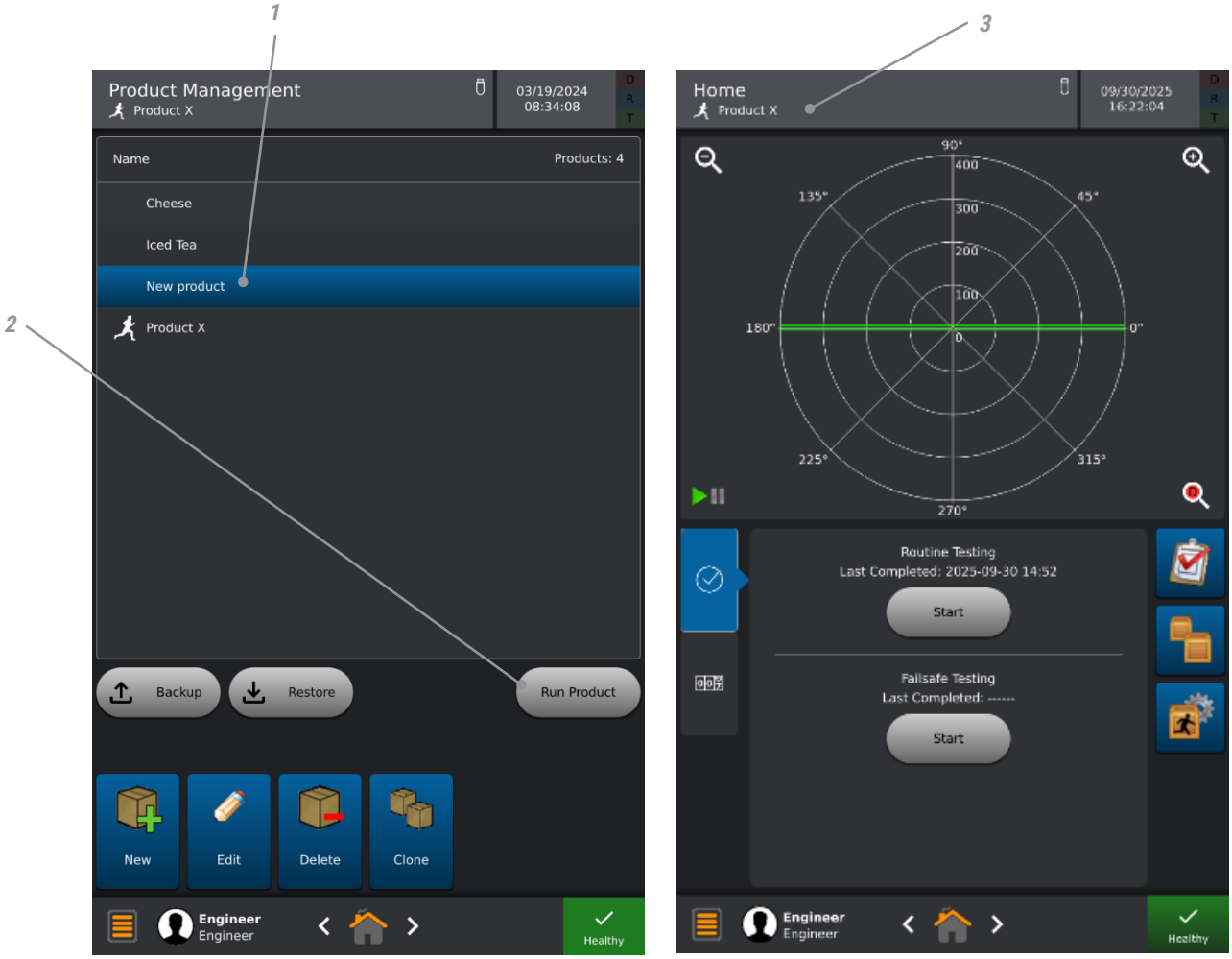


1. From the “Home Screen” select “Running Product Settings”.
2. Select the desired Frequency Mode and Combination Method.
3. Edit product speed. See “HOW TO EDIT PRODUCT SPEED” for more details if needed, on Pg.76
4. Press the “EZ” button.
5. Press the “Start” Button.
6. Pass a single product through the aperture, then press the “Stop” button.
7. If the settings are acceptable select the “Green Check Box”.
8. The sensitivity slider is set to 94 as the default. In most cases no adjustment is necessary to achieve desired sensitivity levels. The sensitivity slider increases to a maximum of 100 and a minimum of 0.

Ensure the belt is running and the product you are setting up is nearby.

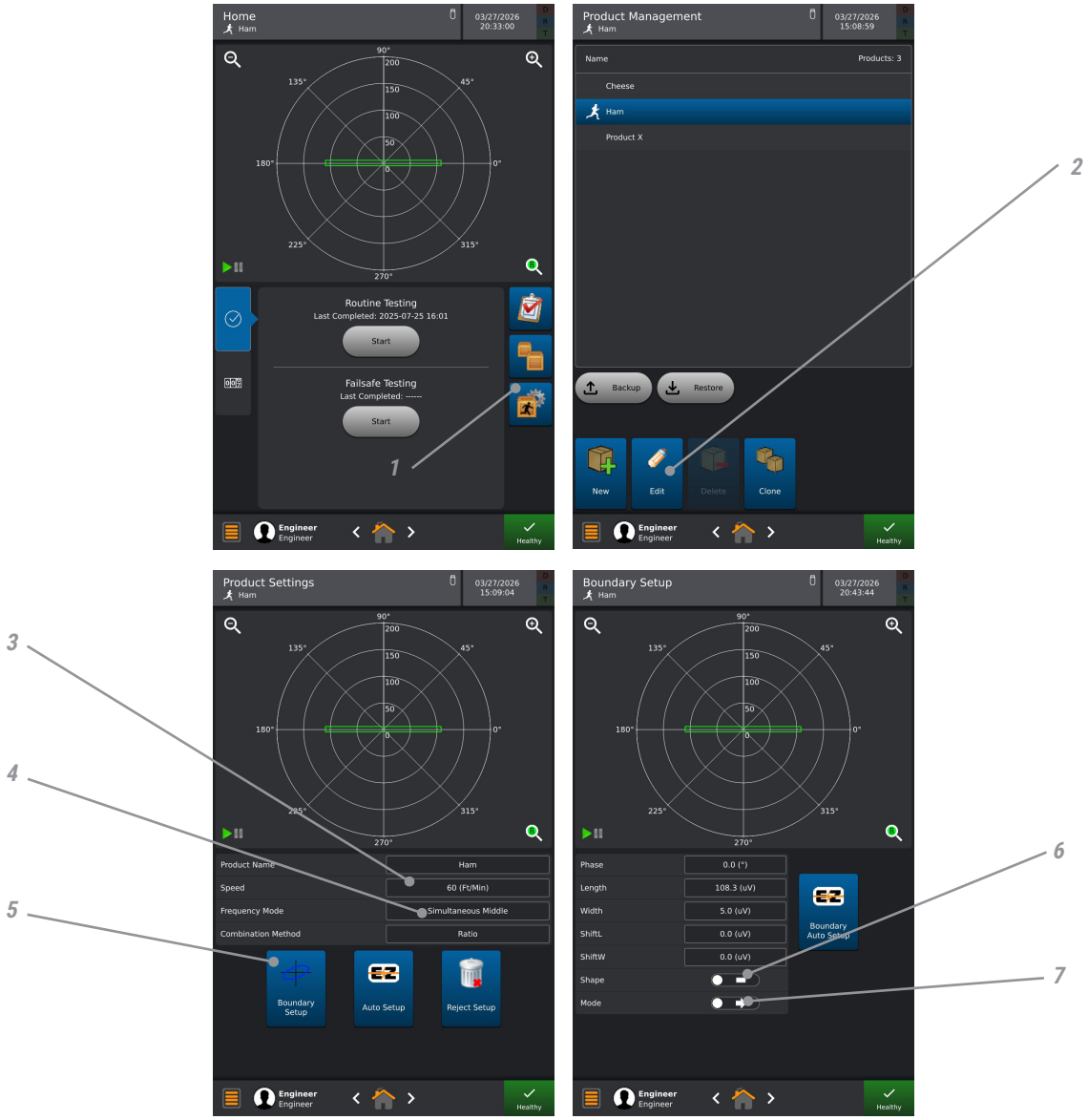
NOTE: The “Save Sensitivity” button under the sensitivity level allows you to save the current setting as the sensitivity default, should the need arise.

“HOW TO” CHANGE/RUN A PRODUCT



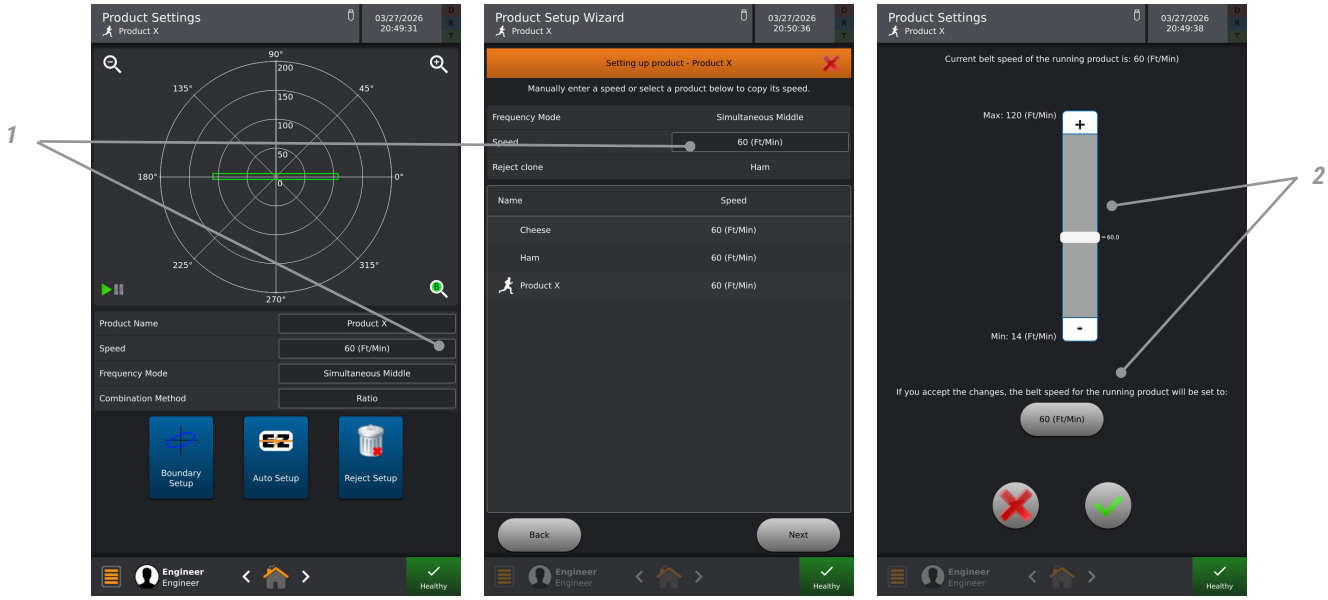
1. From the “Product Setup” Screen select the product you wish to run.
2. Press the “Run Product” button.
3. The Home Screen will now be displayed with the new running product.

“HOW TO” EDIT PRODUCT SETTINGS



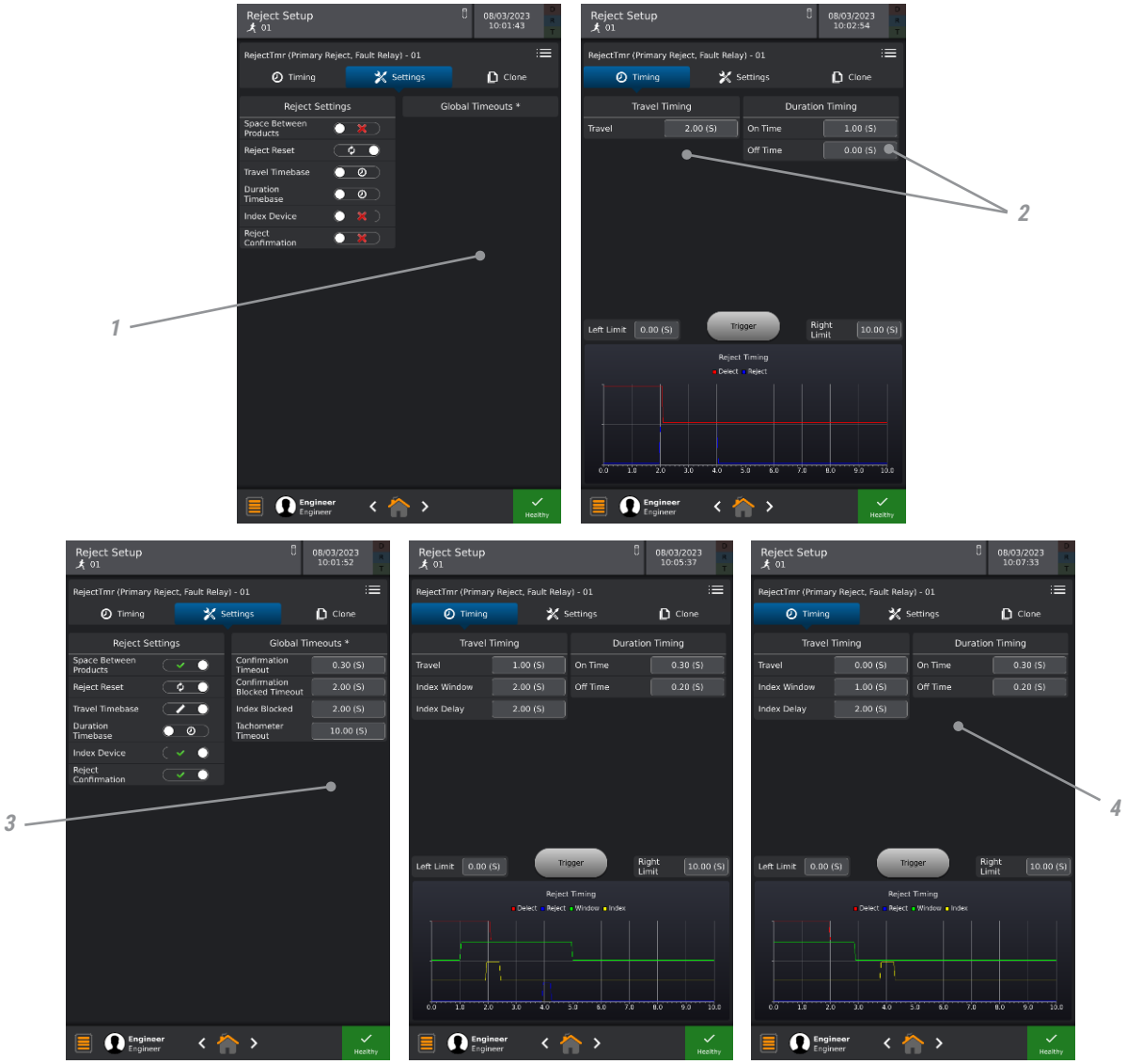
1. Select “Product Setup."
2. Select product you wish to edit and press the “Edit” button.
3. Edit product speed. See “HOW TO EDIT PRODUCT SPEED” for more details if needed, on Pg.76.
4. Select Frequency Mode and Combination Method.
5. Select “Boundary Setup."
6. Press to toggle between the rectangle boundary and the ellipse.
7. Press desired parameter value to alter the “boundary” shown by the blue rectangle (the boundary rectangle will be blue while editing a non-running product, and the boundary rectangle will be green while editing the running product). See “THE DETECTION BOUNDARY EXPLAINED” for more information, on Pg.91

“HOW TO” EDIT PRODUCT SPEED



1. From the Product Settings screen, or from the New Product set up wizard, press the current speed setting.
2. If automatic belt speed control is installed, select the desired belt speed using the slider bar or numerical entry box as shown.
3. Otherwise, enter the physical product speed using the numerical keypad. A tachometer is recommended to get an accurate reading.

“HOW TO” SET UP REJECT TIMING



1. From the “Settings” tab on the “Reject Setup Screen” make the appropriate selections based on your product. Note that not all options may be available depending on the inputs and outputs that have been set up. (See Pg. 83 for Input Configuration)

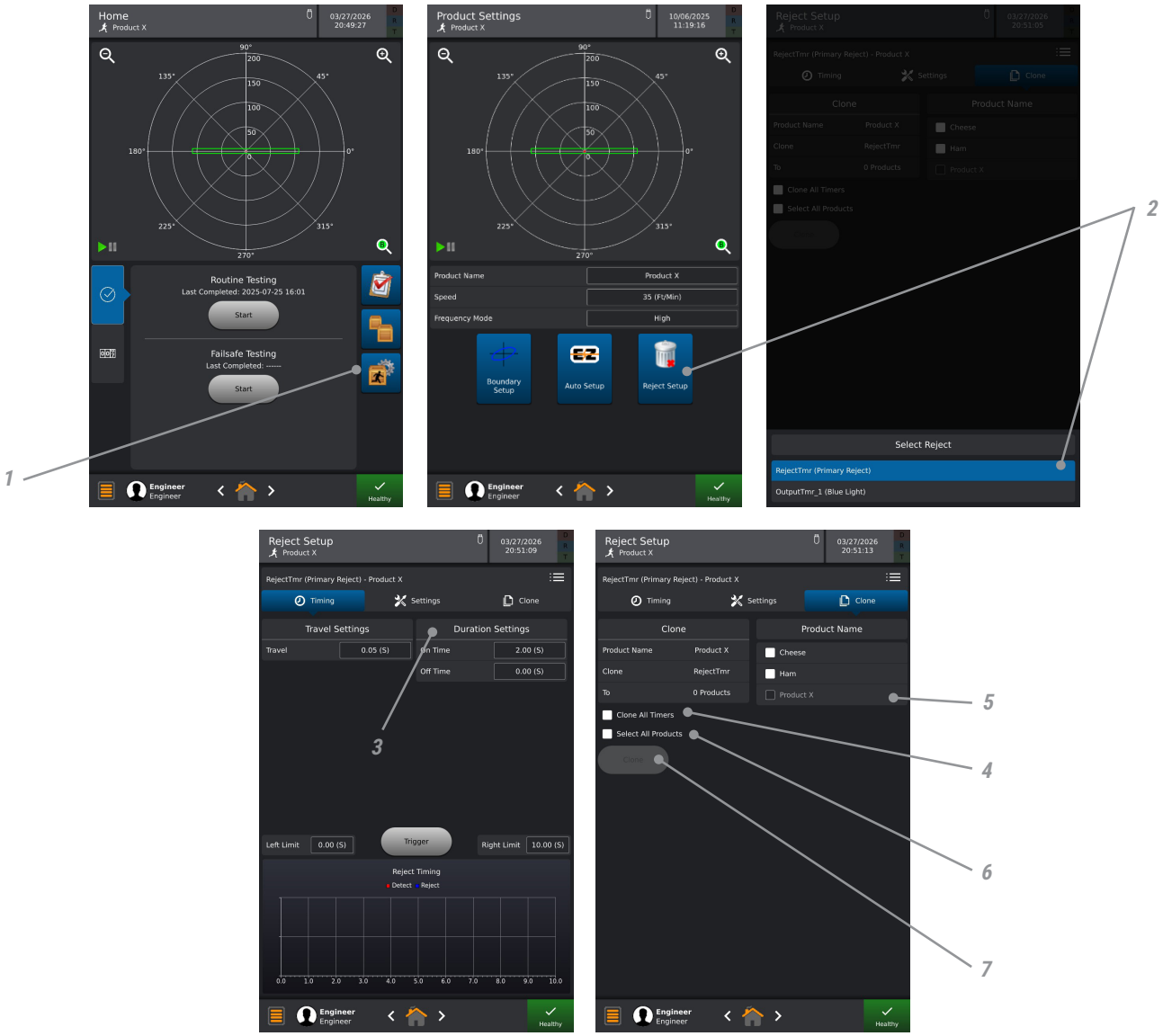
2. In this example an index device (i.e., photo eye) is NOT being used. Set the desired “Travel” and “On Time." The reject device on time (blue) will always be greater than or equal to the detect time (red) regardless of the “On Time” setting. Examples of use would be a stop belt or air blast.

3. In this example an index device (i.e., photo eye) IS being used CORRECTLY. Set the desired “Travel” and “On Time." “Off Time” is usually reserved for Pusher Arm devices. The “Window” (green) opens at the end of the “Travel Time." The index device (yellow) must fire within this window. The index delay is used to delay the reject from firing until it has passed the index device and is ready to be rejected.

4. In this example an index device (i.e., photo eye) IS being used INCORRECTLY. The index device (yellow) did not fire within the window (green). Thus, the reject device did not fire.

Note: The index trace must be in the low state when no product is present. When product is present, the index trace changes to a high state. This relationship can be set by selecting the “Active State” at the Input Configuration screen. (see Pg.83)

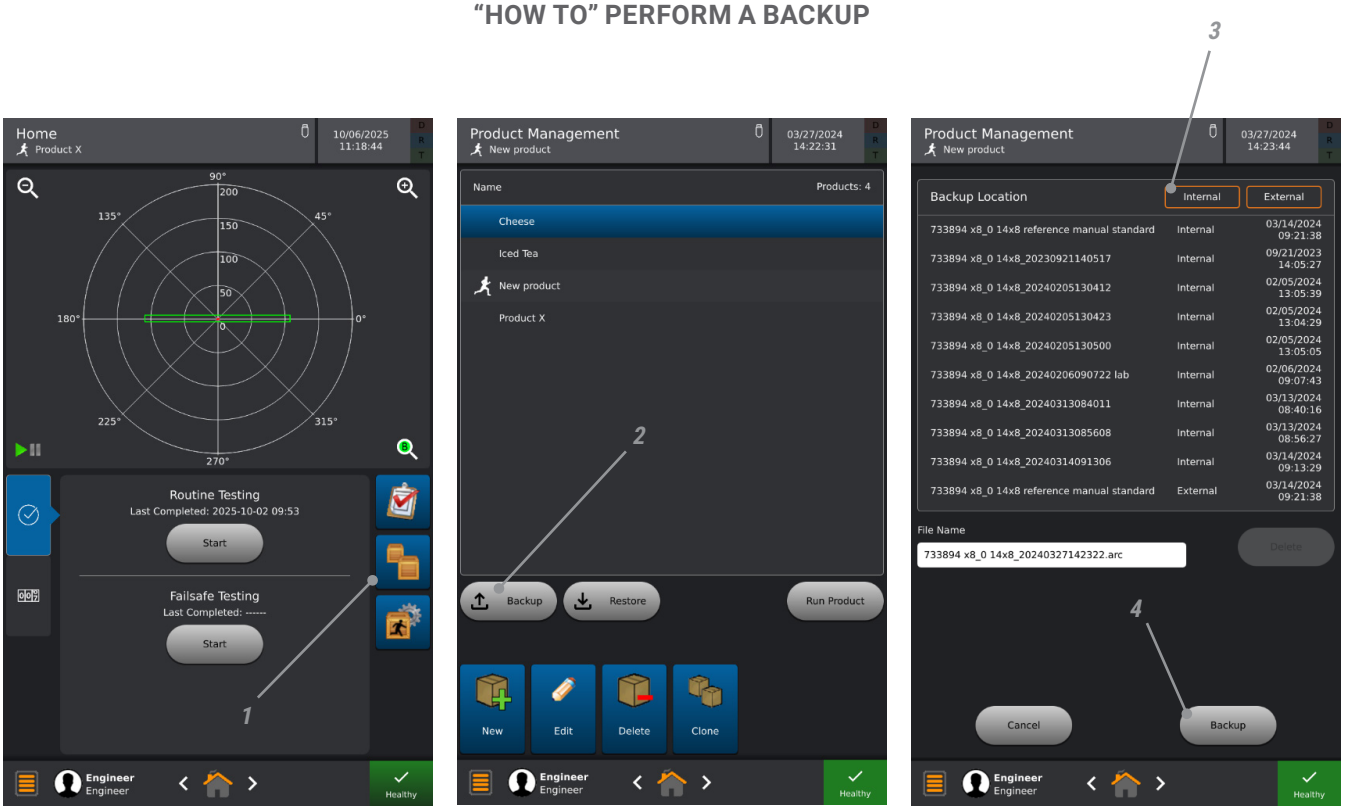
“HOW TO” COPY TIMER SETTINGS



Ensure you have selected and are “running” the product you wish to copy the timer from.

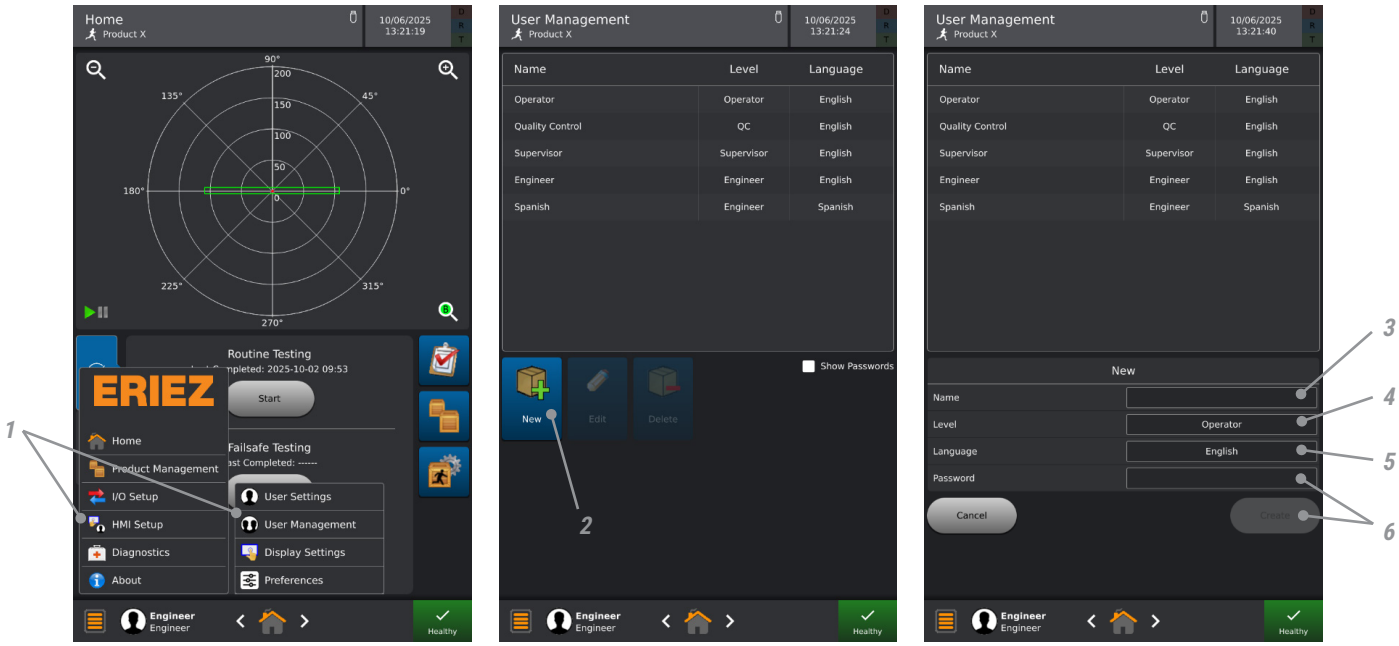
1. From the “Home Screen” select “Running Product Settings."
2. Select “Reject Setup."
3. Select “Clone” from the Advanced Options.
4. Press this option if you wish to copy all timers associated with this product.
5. Select product you wish to copy timer to.
6. Press this option if you wish to copy to all products.
7. Press “Clone” to initiate.

“HOW TO” PERFORM A BACKUP



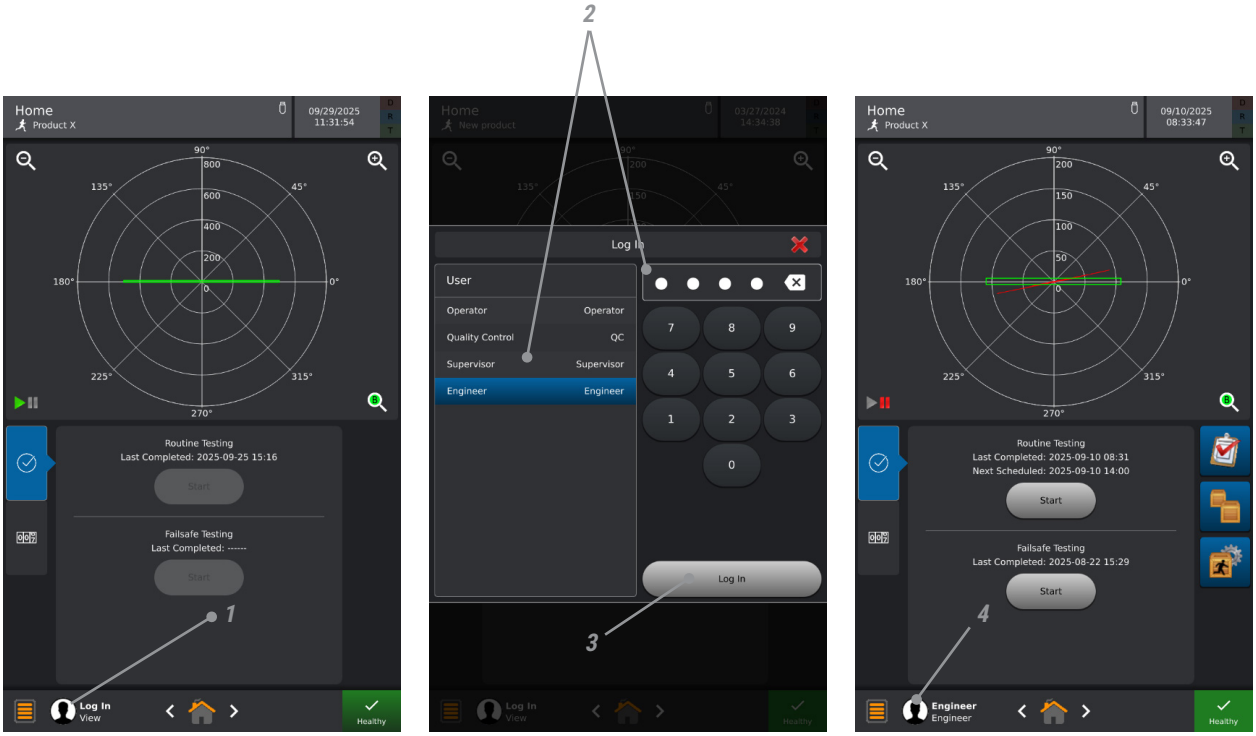
1. From the “Home Screen” press “Product Setup."
2. Select Backup and press “OK.”
3. Select appropriate drive to backup to. If using a “USB Stick” select “External Drive."
4. Press “Backup."
5. “System Backup Complete” will display when finished. Press “OK."

“HOW TO” SET UP A NEW USER



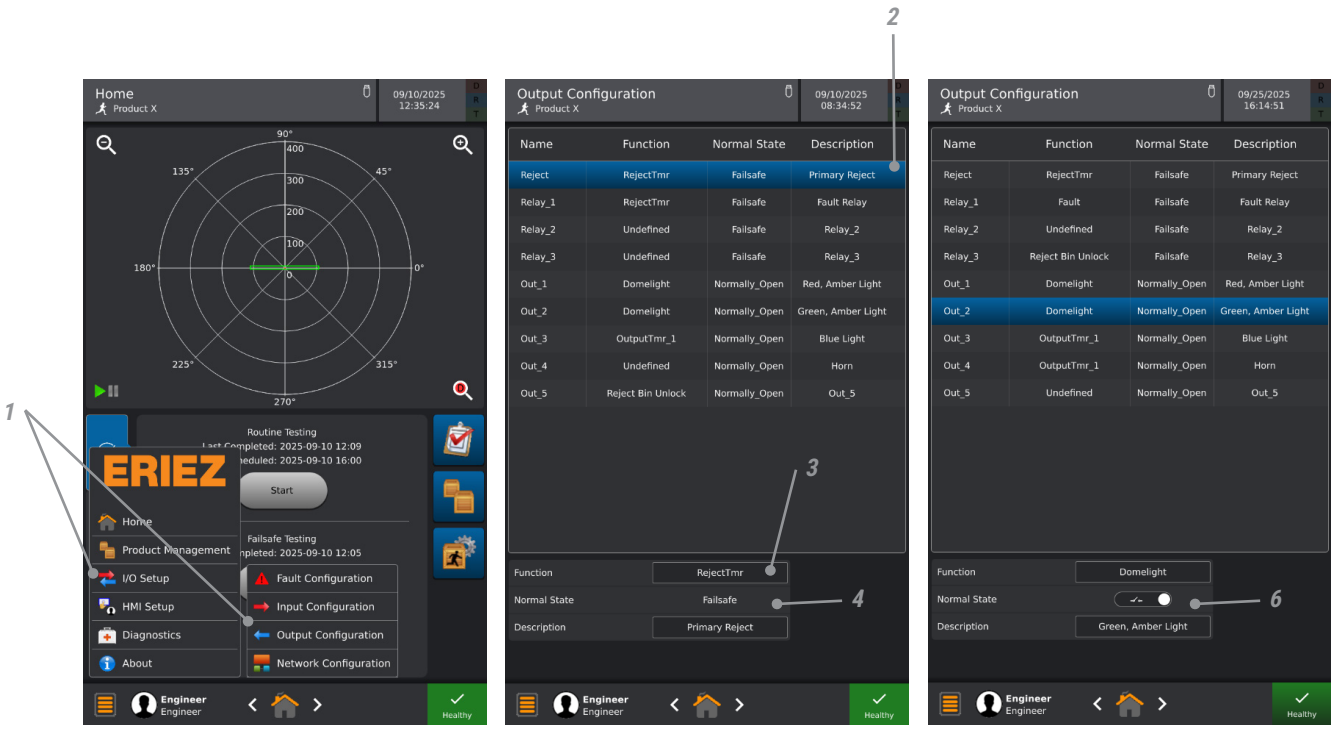
1. From the “Main Menu” select “HMI Setup” then “User Management."
2. Press the “New” button.
3. Input the new user’s name.
4. Select the user login level from the dropdown.
5. Select the user language from the dropdown.
6. Input desired password, confirm the password, and press “Create."

“HOW TO” SWITCH USERS



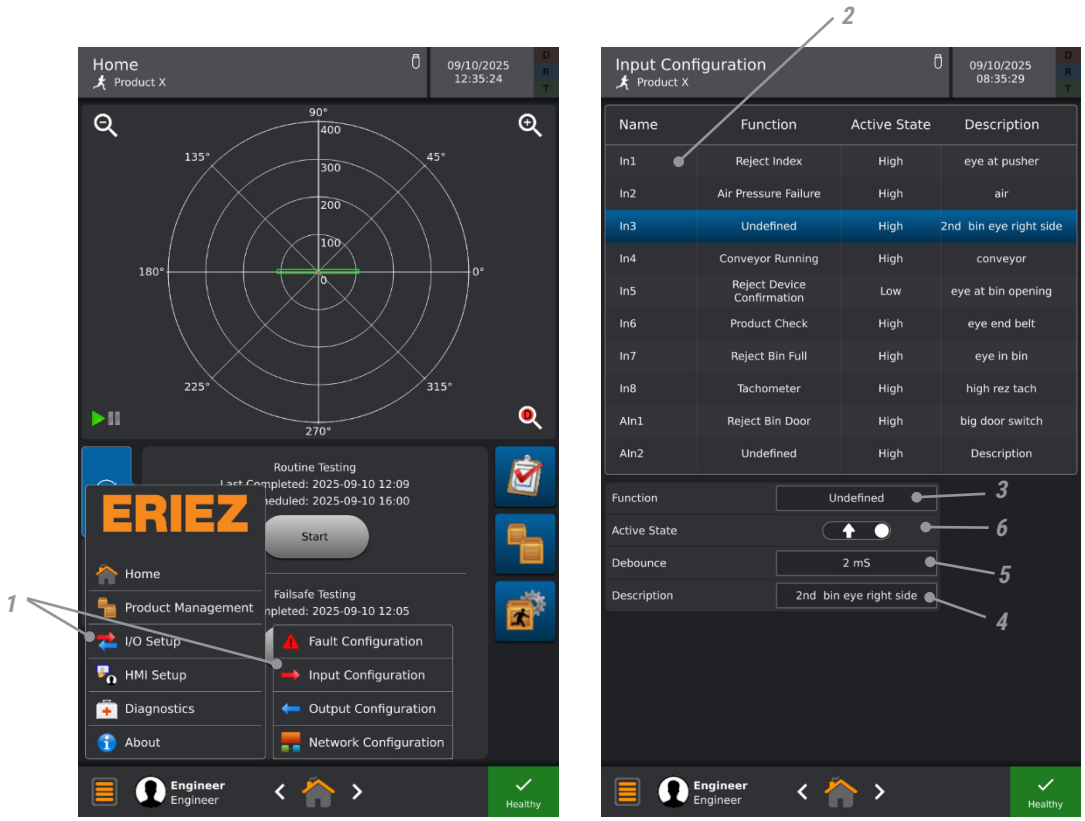
1. From the Task Bar press the User Login button.
2. Select the User Name from the List and enter the password.
3. Press “Log In."
4. Verify User Login Name appears on User Login button.

“HOW TO” SET UP AN OUTPUT DEVICE



1. From the “Main Menu” select “I/O Setup” then “Output Configuration."
2. Select the output that the “output device” is wired to.
3. Select output device function. The “Reject” output has limited functionality and is the primary reject output. Reject and Relay 1-3 are failsafe wired.
4. Enter a description for the output device.
5. Out 1-5 are solid state relays and are not failsafe.
6. Select the active state (Normally Open/Normally Closed) when using Out 1-5.

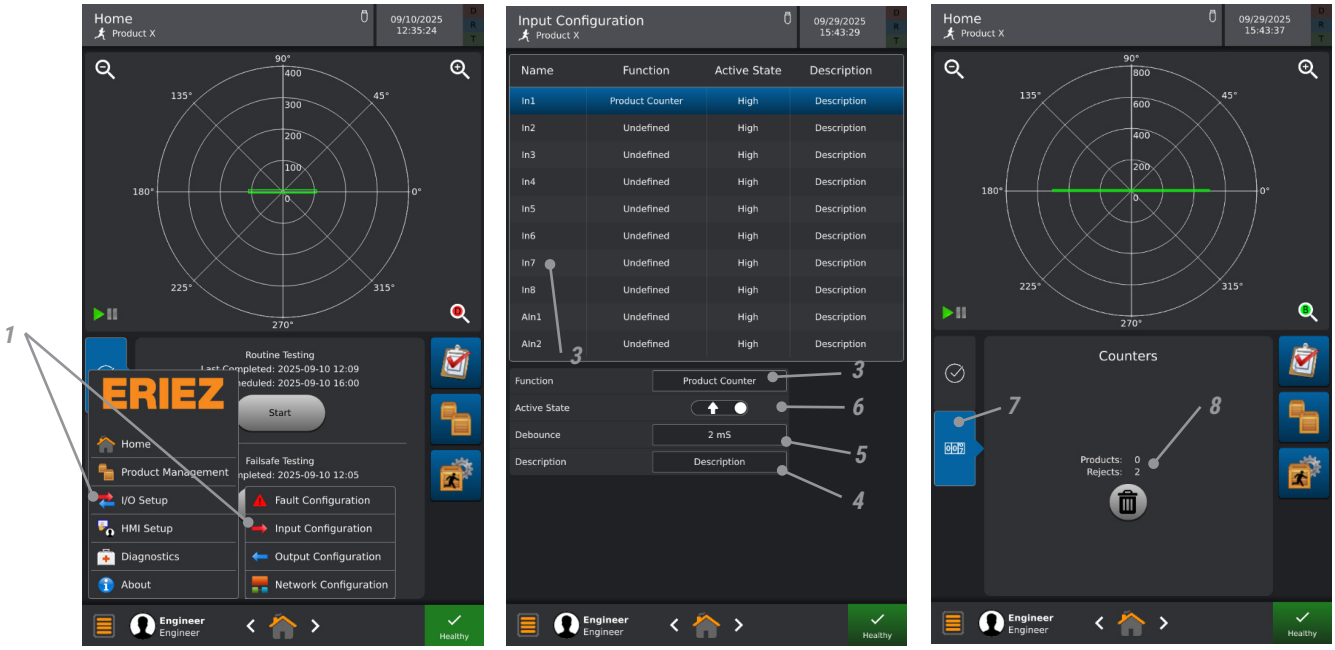
“HOW TO” SET UP AN INPUT DEVICE



1. From the “Main Menu” select “I/O Setup” then “Input Configuration."
2. Select the input that the “input device” is wired to.
3. Select the device function (i.e., tachometer, overhead, etc.).
4. Enter a description for the input device.
5. Set the debounce. In most cases the 2 mS default is sufficient.
6. Select “Active State” for input device. High = 10-30V Low = 0-0.9V

NOTE: Not all input functions are available for all inputs. Example: High speed tachometres can only be used on In8.

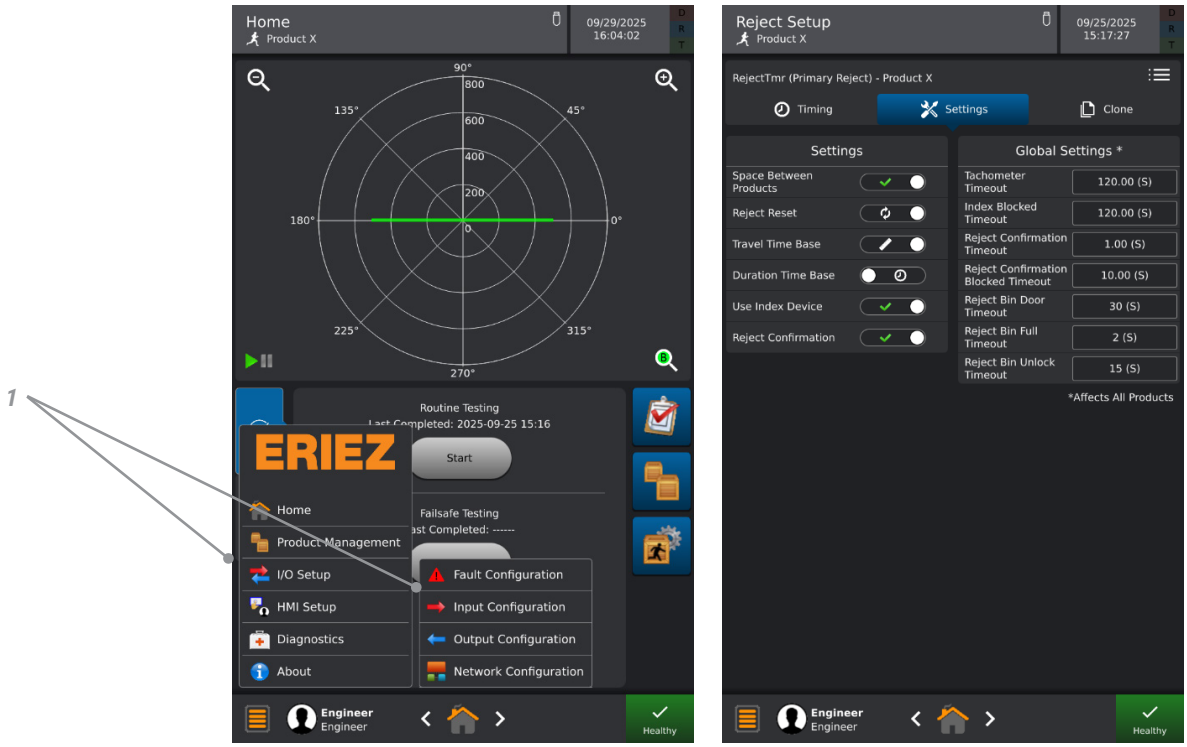
“HOW TO” SET UP PRODUCT COUNTING



1. From the “Main Menu” select “I/O Setup” then “Input Configuration."
2. Select the input that the photo-eye is wired to. Note: It is possible to use one photo-eye for two functions (e.g., “Reject Index” and “Product Counter”); in this case, the photo-eye must be wired to two inputs on the IOC circuit board (e.g., “In3” and “In4”).
3. Select “Product Counter” for the device function.
4. Enter a description if desired.
5. Set the debounce. In most cases, the 2 mS default is sufficient.
6. Select “Active State” for the photo-eye. “Active State” is state when the product is in front of the photo-eye. High = 10-30V Low = 0-0.9V
7. When the above steps are completed, the “Counters” block will be displayed on the home screen. “Product” counts activations of the “Product Counter” input; “Reject” counts actuations of the primary reject output.
8. Both counts can be cleared by pressing the button shown.

NOTE: The Reject Index can also be used as a product counter by toggling the option on the input configuration screen.

“HOW TO” SET UP A REJECT DEVICE



1. Ensure reject device and all associated devices (i.e., photo eye, tachometer, etc.) are wired into the control. See Electrical Installation section.
2. Configure Input and Output Devices.
3. Configure “Advanced Reject Settings” page.
4. Set up reject timing.

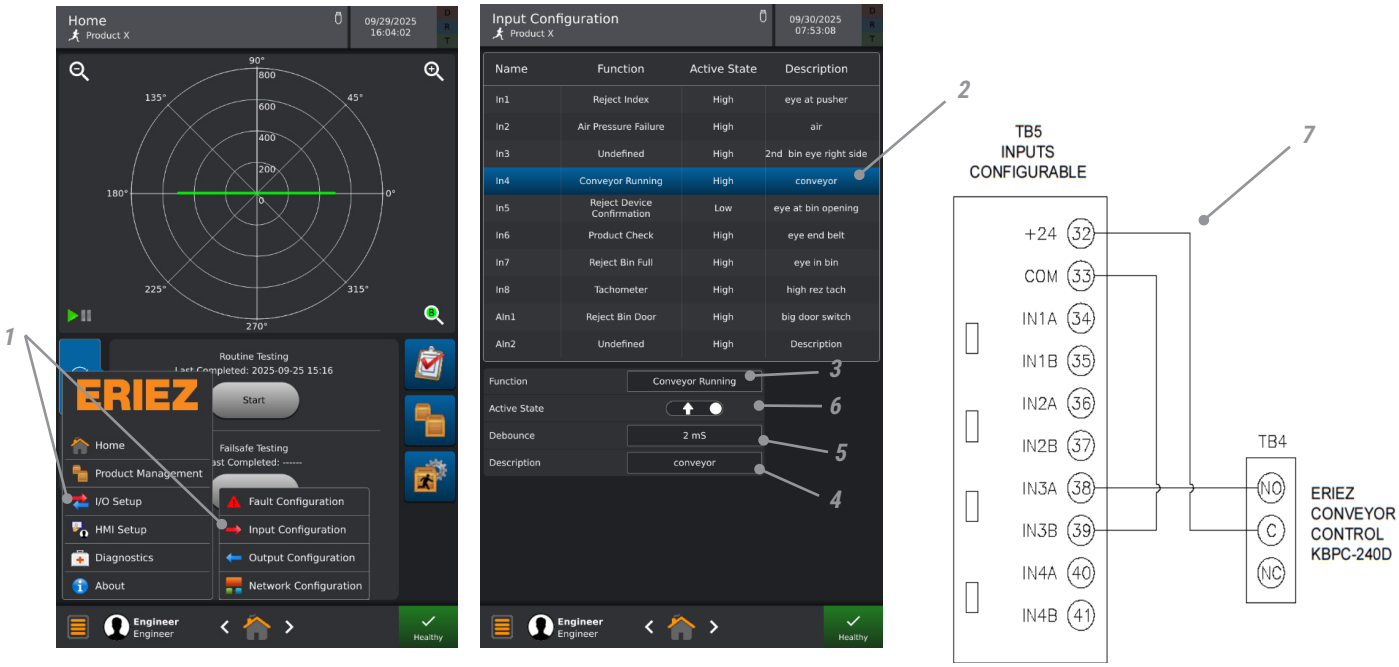
“HOW TO” Set up AN INPUT DEVICE Pg.83

“HOW TO” Set up AN OUTPUT DEVICE Pg.82

ADVANCED REJECT Setup Pg.68

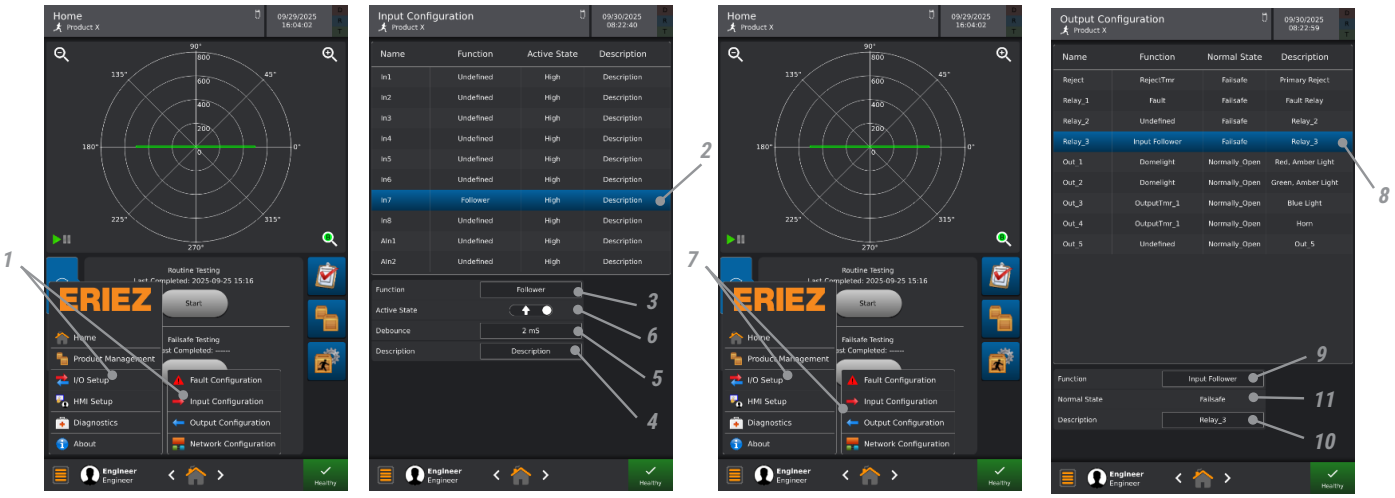
“HOW TO” Set up REJECT TIMING Pg.77

“HOW TO” SET UP CONVEYOR RUNNING



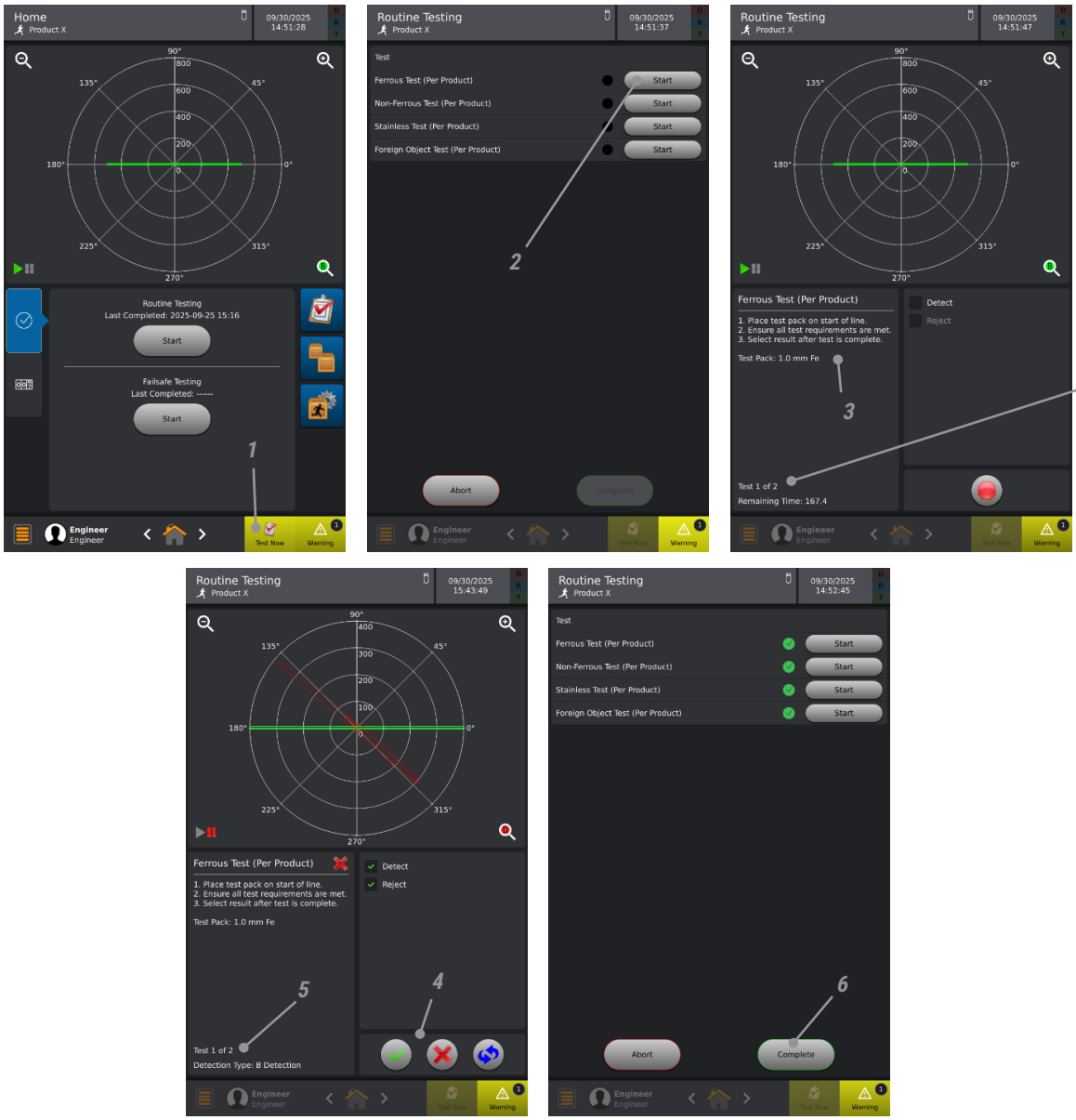
1. From the “Main Menu” select “I/O Setup” then “Input Configuration."
2. Select the input that the conveyor status is connected to on the IOC board (e.g., “In3”).
3. Select “Conveyor Running” for the device function.
4. Enter a description if desired.
5. Set the debounce. In most cases, the 2 mS default is sufficient.
6. Select “Active State” as shown. High = 10-30V Low = 0-0.9V.
7. Complete the wiring to the desired input between the X8-SF and TB4 located on the Conveyor Control. Use the diagram as a reference, it shows “IN3” being connected as an example.

“HOW TO” SET UP INPUT/OUTPUT FOLLOWER



1. From the “Main Menu” select “I/O Setup” then “Input Configuration."
2. Select the input that the sensor will connect to (e.g., “In7”).
3. Select “Follower” for the device function.
4. Enter a description if desired.
5. Set the debounce. In most cases, the 2 mS default is sufficient.
6. Select “Active State” for the sensor (High = 10-30V Low = 0-0.9V).
7. From the “Main Menu” select “I/O Setup” then “Output Configuration."
8. Select the output that will follow the state of the “Input Follower” input.
9. Select “Input Follower” for the output function.
10. Enter a description if desired.
11. Select whether the output will be normally open or normally closed.
12. Reference Pg.33 and Pg.34 for wiring the Input/Output follower. Use of the internal power sources as shown in the examples is recommended. Some devices connected to Out 1-5 may be sensitive to the inherent solid-state leakage current, use Relay 1-3 in lieu of Out 1-5 if leakage current is an issue.

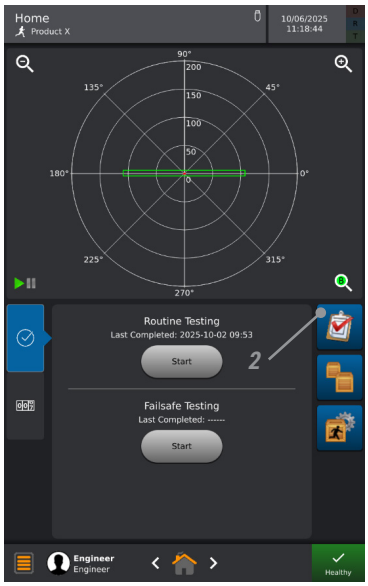
“HOW TO” PERFORM A ROUTINE TEST

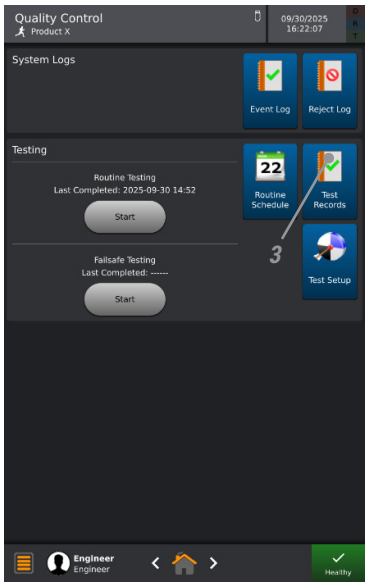


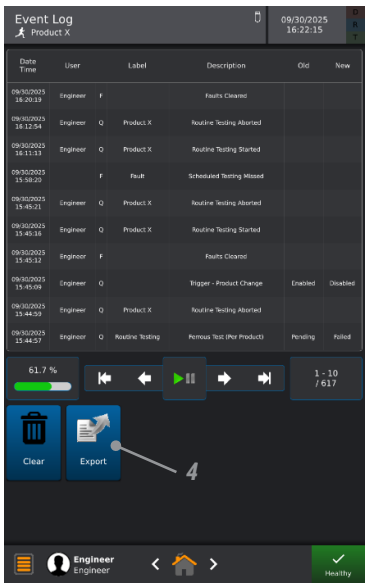
1. On the task bar press “Test Now”.
2. Press the metal type you wish to test.
3. Pass the listed metal on the product through the aperture and press the “Stop” button.
4. Select Pass, Fail, or Retry and repeat the process if necessary for the other metals.
5. Detection Type indicates whether there is a detections or not. The “B” matches the indicator placed in the reject log for boundary detections.
6. Press “Complete” when all metals have been tested.

NOTE: The example above is of Single metal tests (Per product) only being enabled.
NOTE: Other test options are available on the Test Setup page depending on testing requirements.

“HOW TO” EXPORT REPORT LOGS





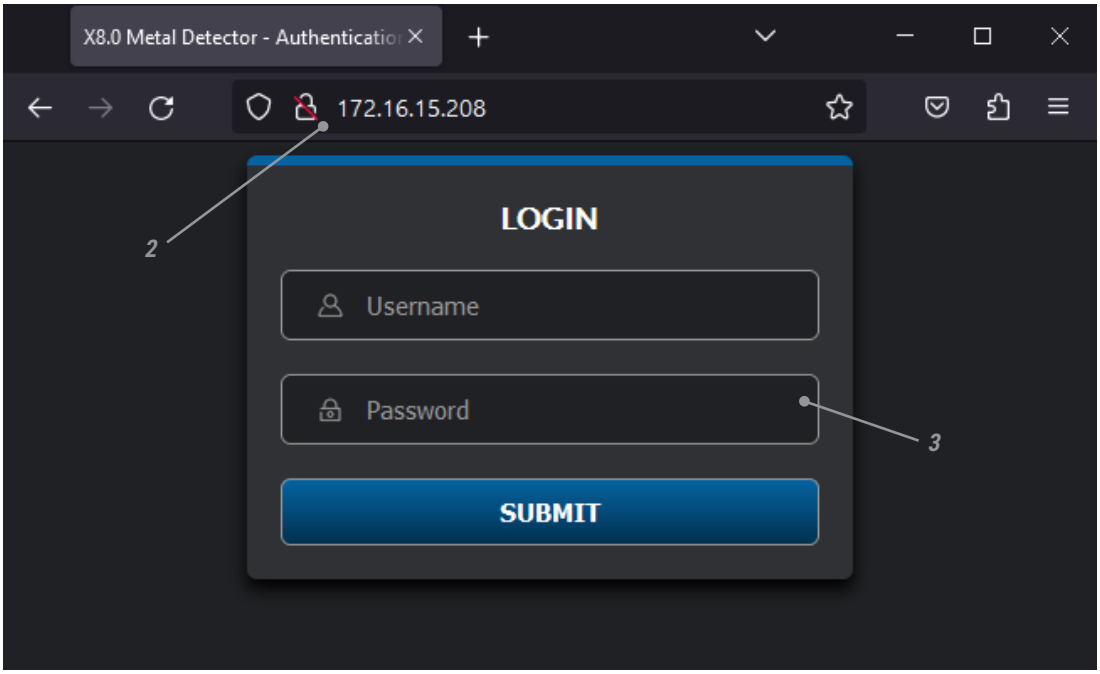


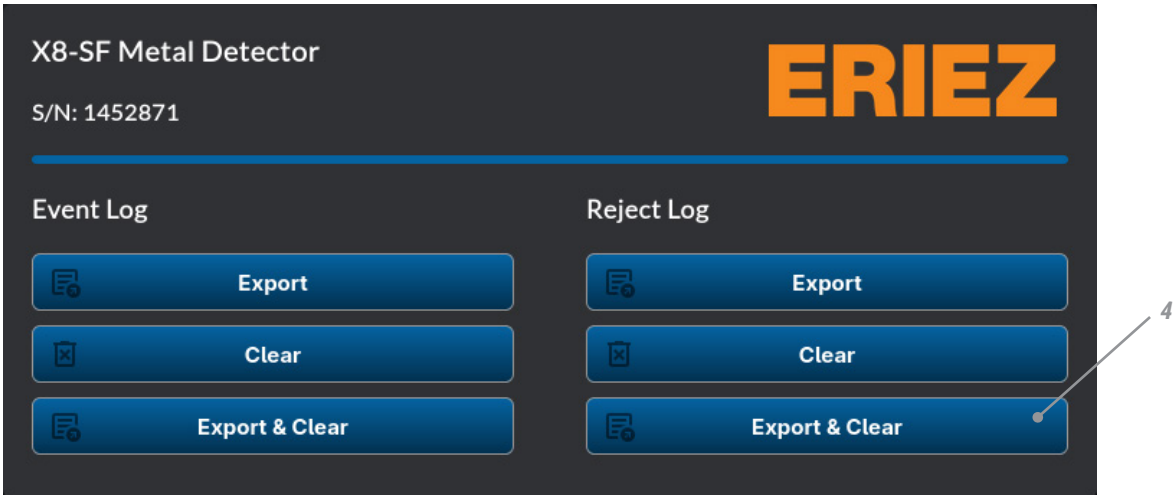
1. Ensure a USB drive is inserted into the USB connector.
2. From the “Home Screen” select “Quality Control."
3. Select which Log you would like to view and export.
4. Press export. You now have the option to rename the file. Press “OK” after the “Done exporting Log” window pops up.

CAUTION

Ensure the USB drive is removed, and the USB connector cap is in place and locked (Pg.29), before any washdown operation is performed.

"HOW TO" REMOTELY EXPORT REPORT LOGS

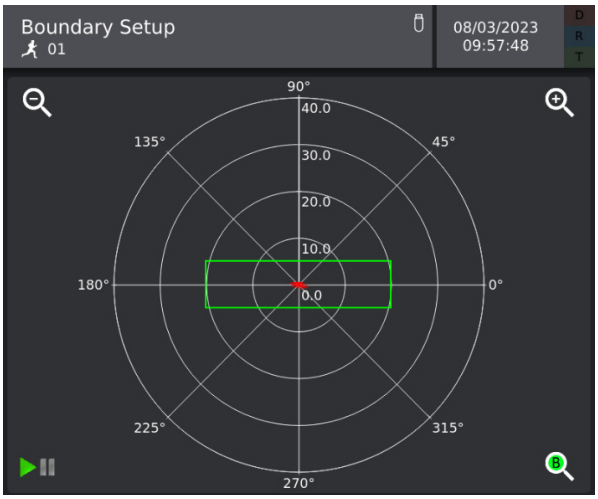


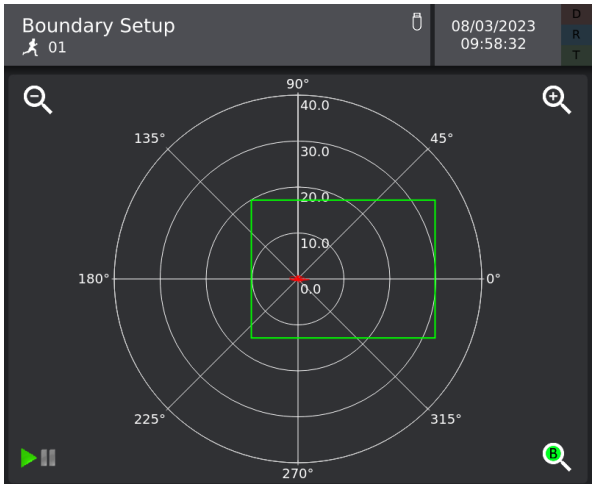


1. Ensure that the metal detector is assigned a valid IP address using the Network Configuration Page (Pg. 54).
2. From a computer on the same network, enter the IP address of the metal detector in the search bar of a web browser.
3. Log in using the username and password of a user created on the metal detector. Note that the user level should be at least Quality Control.
4. From the WebUI, you have the options to "Clear," "Export," and "Export and Clear."

NOTE: Device login is only possible if cookies are enabled in the browser settings

DETECTION BOUNDARY EXPLAINED





1. Phase adjustment (degrees). Should align with product signal.
2. Length adjustment (uV). Should run parallel to product signal length.
3. Width adjustment (uV). Should run parallel to product signal width.
4. Shift about the length axis in parallel with selected phase.
5. Shift about the width axis in perpendicular with selected phase.
6. Detection Boundary shape selection. Default is the rectangle.

Rectangle

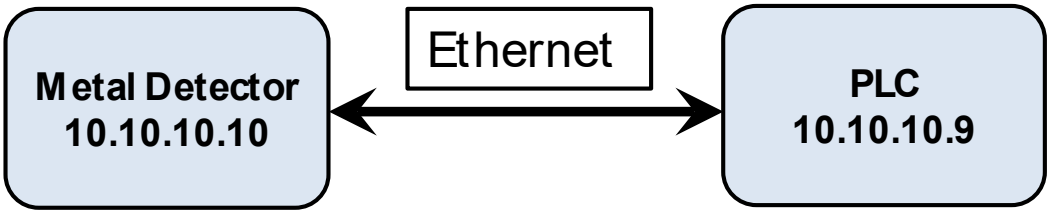
Ellipse

ERIEZ

ETHERNET IP INTERFACE
BETWEEN X8-SF METAL DETECTOR AND PLC

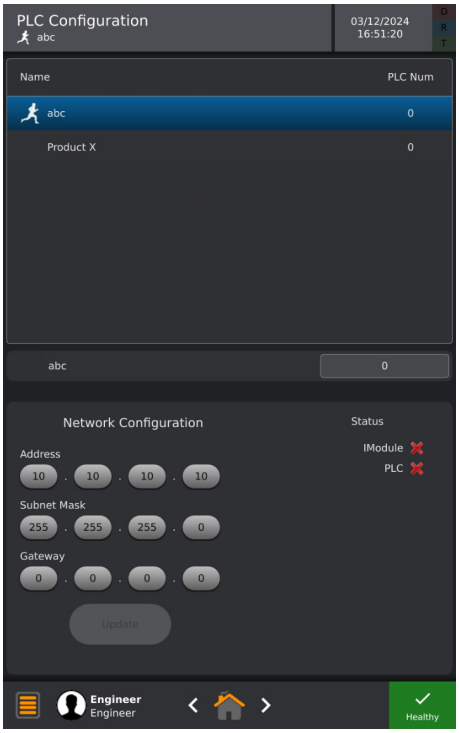
INTRODUCTION

A Programmable Logic Controller (PLC) can be connected to the metal detector by means of the factory installed PLC Interface Module. This module allows the PLC to set and retrieve the running product number. It can also retrieve metal detector status information.



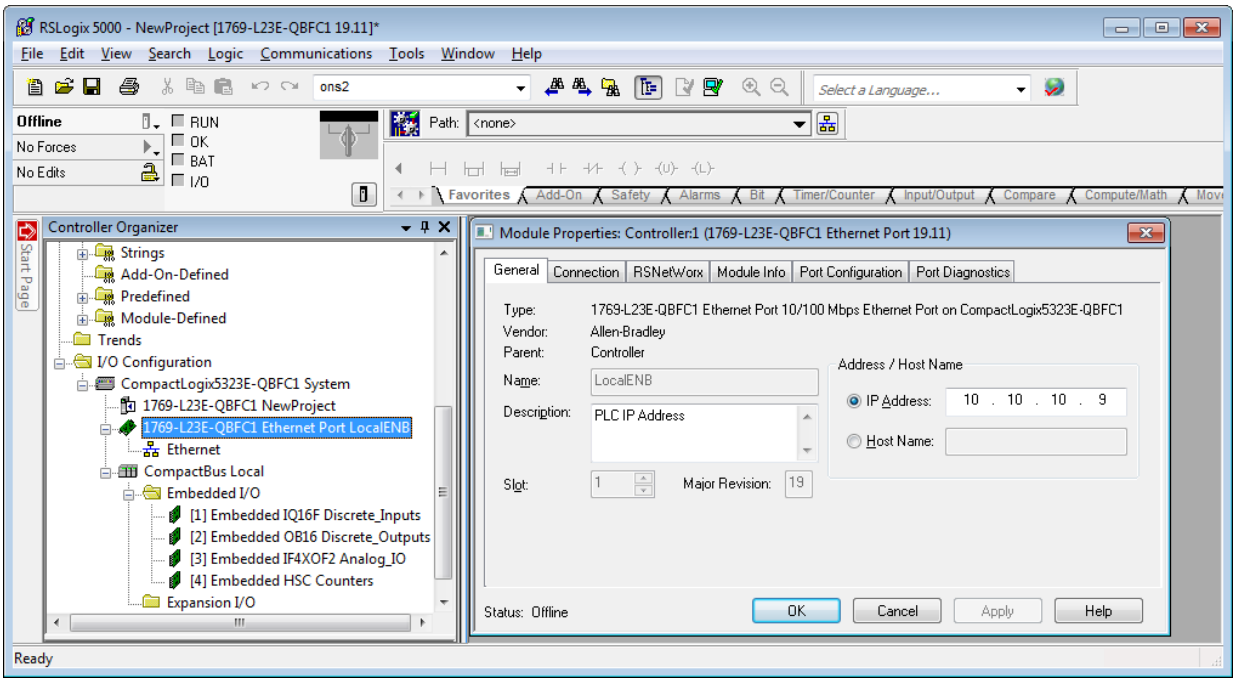
METAL DETECTOR COMMUNICATION Set up

1. From the metal detector “Main Menu” select “I/O Setup” then select “PLC Configuration.
2. Verify that the “IModule” status is green. If it is red, please contact the factory for assistance.
3. Assign product numbers (1, 2, 3 …) to all products that will be remotely selected from the PLC. Assigning 0 to any product makes it un-selectable by the PLC.
4. Connect an Ethernet cable between the Metal Detector and the desired network. The “red” CAT5 cable in the metal detector is for the PLC connection while the “blue” is for remote support (if installed).

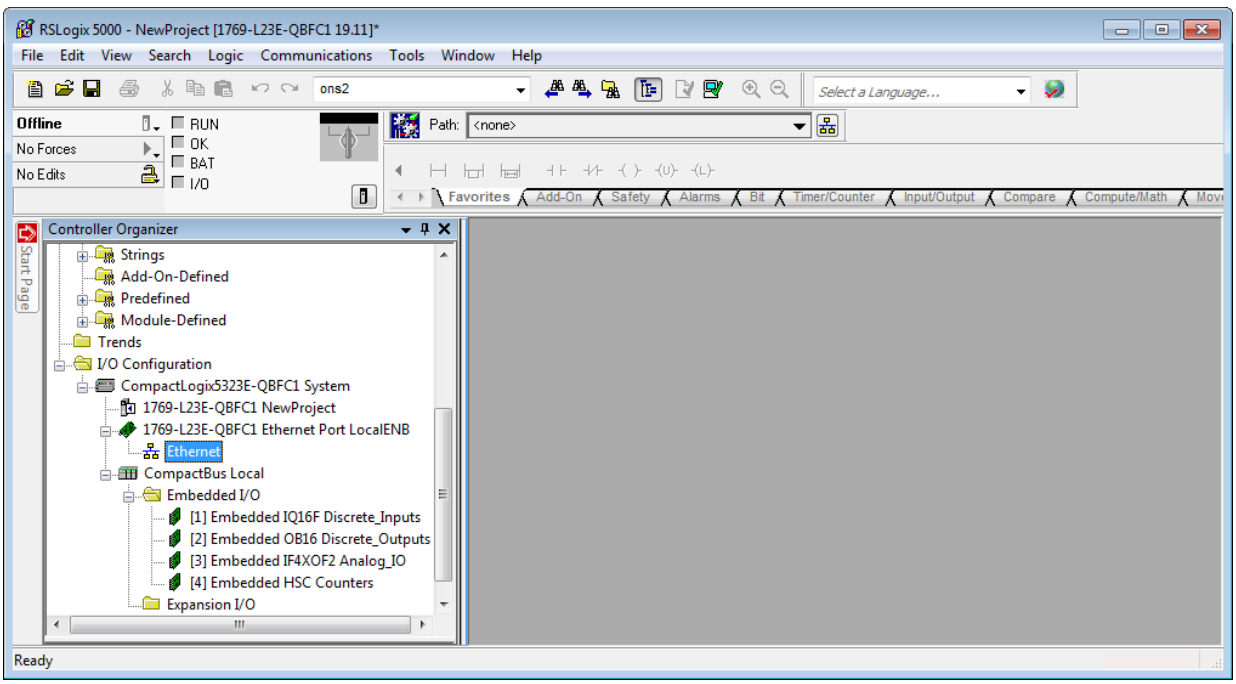


PLC COMMUNICATION SET UP

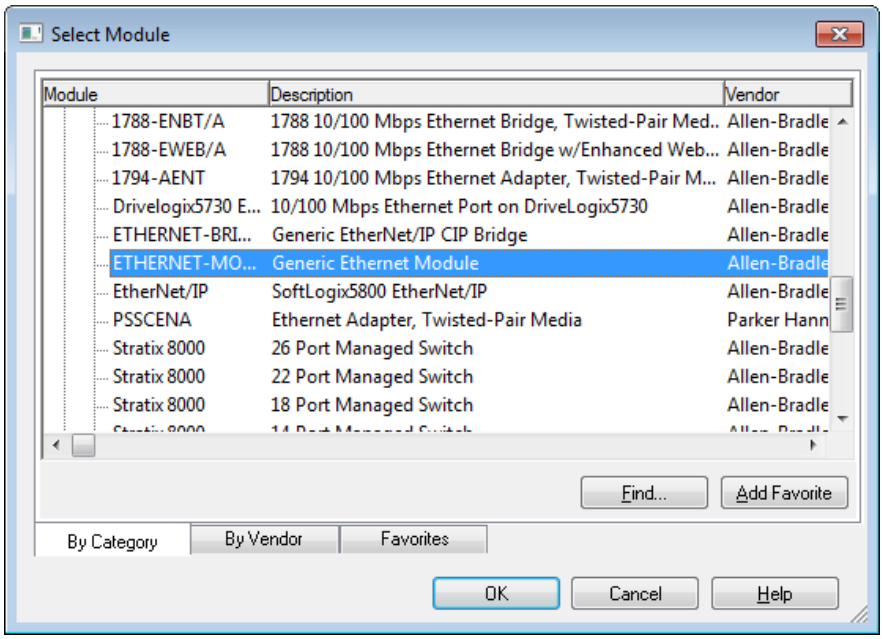
In the Controller Organiser window, under I/O Configuration, right click on your controller Ethernet Port LocalENB. Select Properties, select the General Tab, and assign the PLC Ethernet IP Address,(such as 10.10.10.9)



In the Controller Organiser window, under I/O Configuration, under your controller, right click on “Ethernet”, select New Module.



From the Select Module dialog box expand Communications and select “Generic Ethernet-Module." Press “OK."



On the New Module Properties Page (General tab):

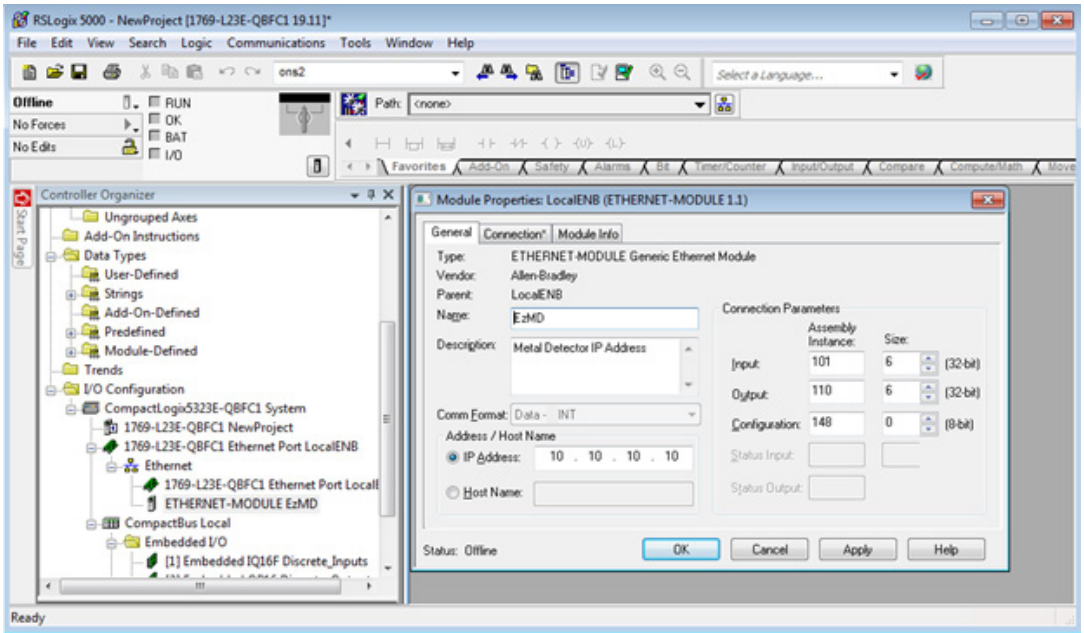
A. Assign a unique name (such as EzMD)

B. Assign the Metal Detector IP Address (such as 10.10.10.10). Please note that this must match the address set on the PLC Configuration page of the metal detector.

C. Set Assembly Instance Input to 101 and Size to 6.

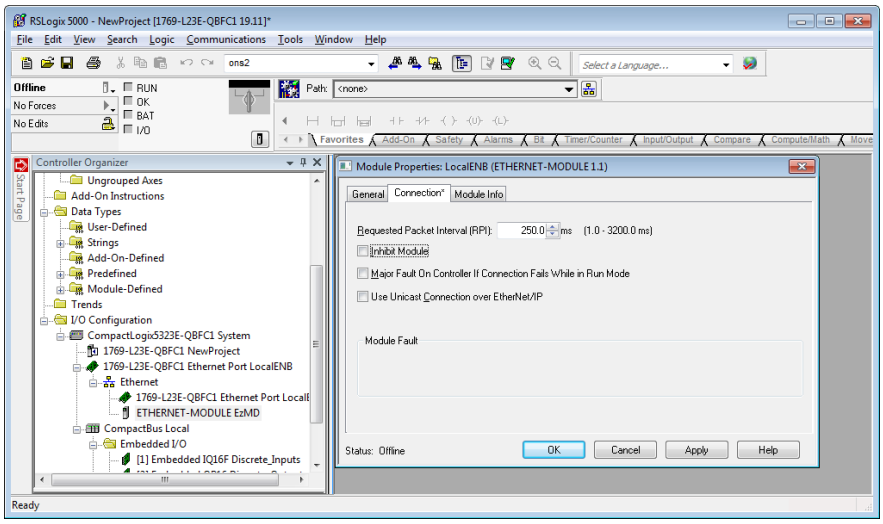
D. Set Assembly Instance Output to 110 and Size to 6.

E. Set Assembly Instance Configuration to 148 and Size to 0.



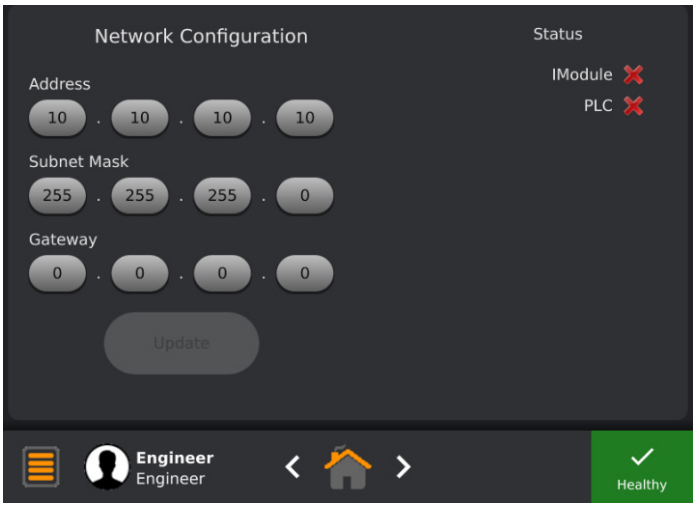
From the “Module Properties: LocalENB” select the Connection Tab.

A. Set the “Requested Pack Interval” (RPI) to 250 mS.



Connect the PLC Ethernet cable to the same network as the metal detector.

On the metal detector PLC Configuration screen, verify both the “IModule” and “PLC” status lights are green.



PLC PROGRAMMING

The PLC communicates with the Metal Detector using two 6-word blocks of memory in the Generic Ethernet Module. Each word is 16 bits.

EzMD:O.	PLC output	EzMD:1.	PLC input
Data[0]	reserved	Data[0]	metal detector status
Data[1]	command	Data[1]	command confirmation
Data[2]	param 1 to send	Data[2]	received param 1
Data[3]	param 2 to send	Data[3]	received param 2
Data[4]	param 3 to send	Data[4]	received param 3
Data[5]	reserved	Data[5]	metal detector heartbeat

The PLC initiates all communication with the metal detector by first filling in the necessary output (send) parametres, then writing (a command) to EzMD:O.Data[1].
When the metal detector responds with the same command and any associated input (receive) parametres, the PLC writes a NO-OP command 0xFF to EzMD:O.Data[1] and the Metal Detector responds with 0x00.
The following Metal Detector commands are available:

Decimal	Hex	Command
1	0x0001	Set Running Product (for example product 3) MOV 3 to EzMD:O.Data[2] MOV 16#0001 to EzMD:O.Data[1]
	Reply	EzMD:I.Data[0] contains metal detector status EzMD:I.Data[1] contains command 16#0001 EzMD:I.Data[5] contains metal detector heartbeat see Sample Program ladder diagram rung 6
2	0x0002	Read Running Product MOV 16#0002 to EzMD:O.Data[1]
	Reply	EzMD:I.Data[0] contains metal detector status EzMD:I.Data[1] contains command 16#0002 EzMD:I.Data[2] contains running product number EzMD:I.Data[5] contains metal detector heartbeat see Sample Program ladder diagram rung 5
3	0x00FF	No operation
	Reply	EzMD:I.Data[0] contains metal detector status EzMD:I.Data[1] contains command 16#0000 EzMD:I.Data[5] contains metal detector heartbeat See Sample Program ladder diagram rung 8 for automatic no-op insertion

Metal detector status EzMD:I.Data[0] is updated approximately every second and with every command exchange. See the sample program rung 0.

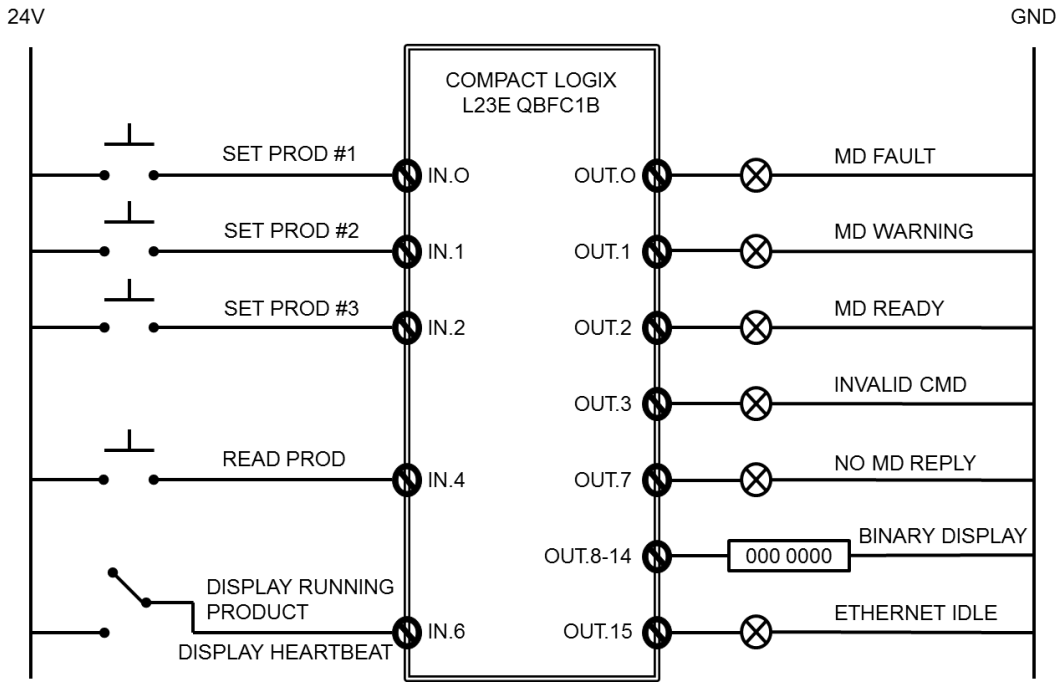
Bit	Description	Value=1	Value=0
0	metal detector fault	fault	no fault
1	metal detector warning	warning	no warning
2	metal detector ready	ready	not ready
3	Invalid Ethernet command	invalid	valid
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15	no reply from metal detector	no reply	reply

The Metal Detector increments a 16-bit counter (heartbeat) and sends it back to the PLC EzMD:I.Data[5] with every status update. See the Sample Program ladder diagram rung 1.

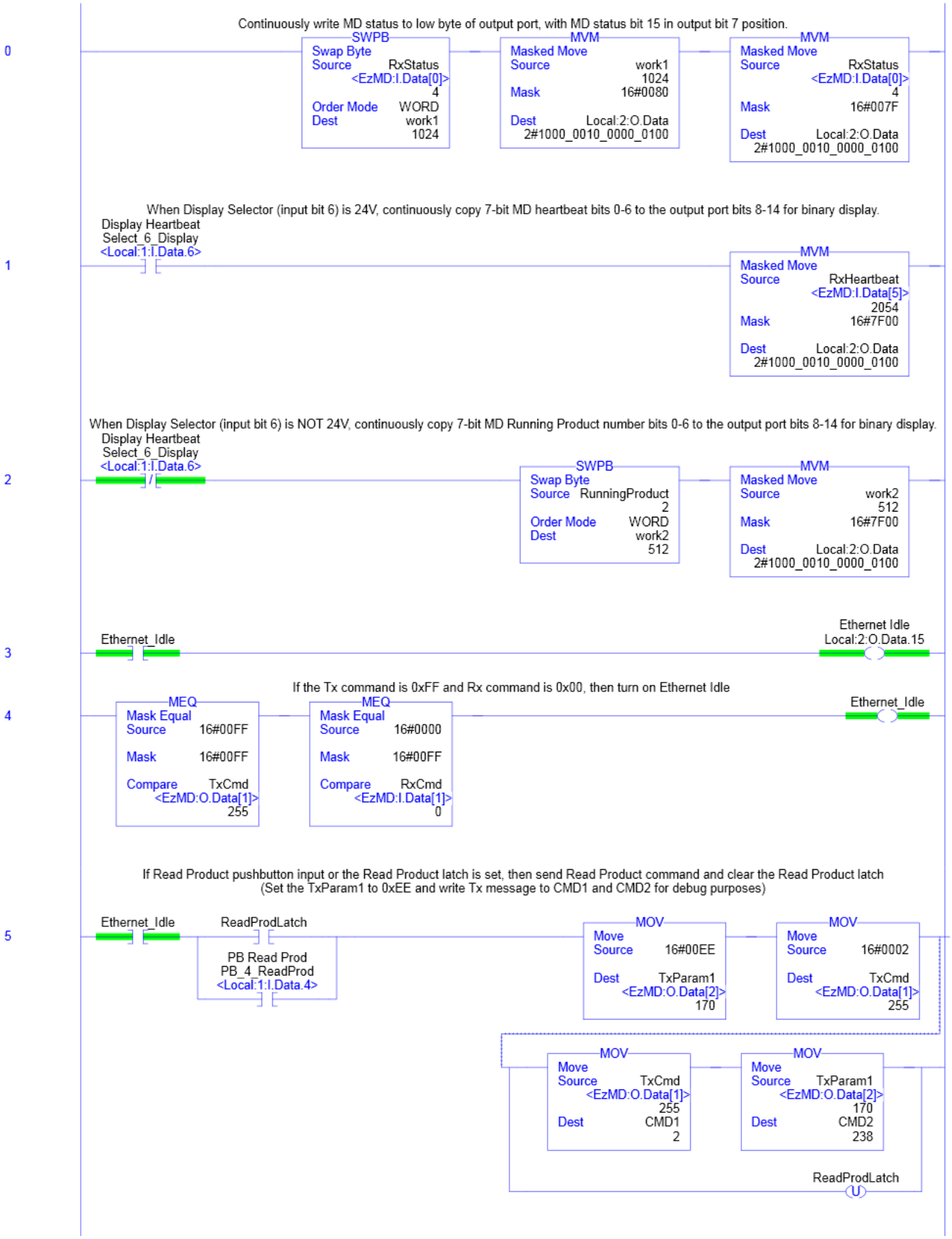
SAMPLE PLC PROGRAM

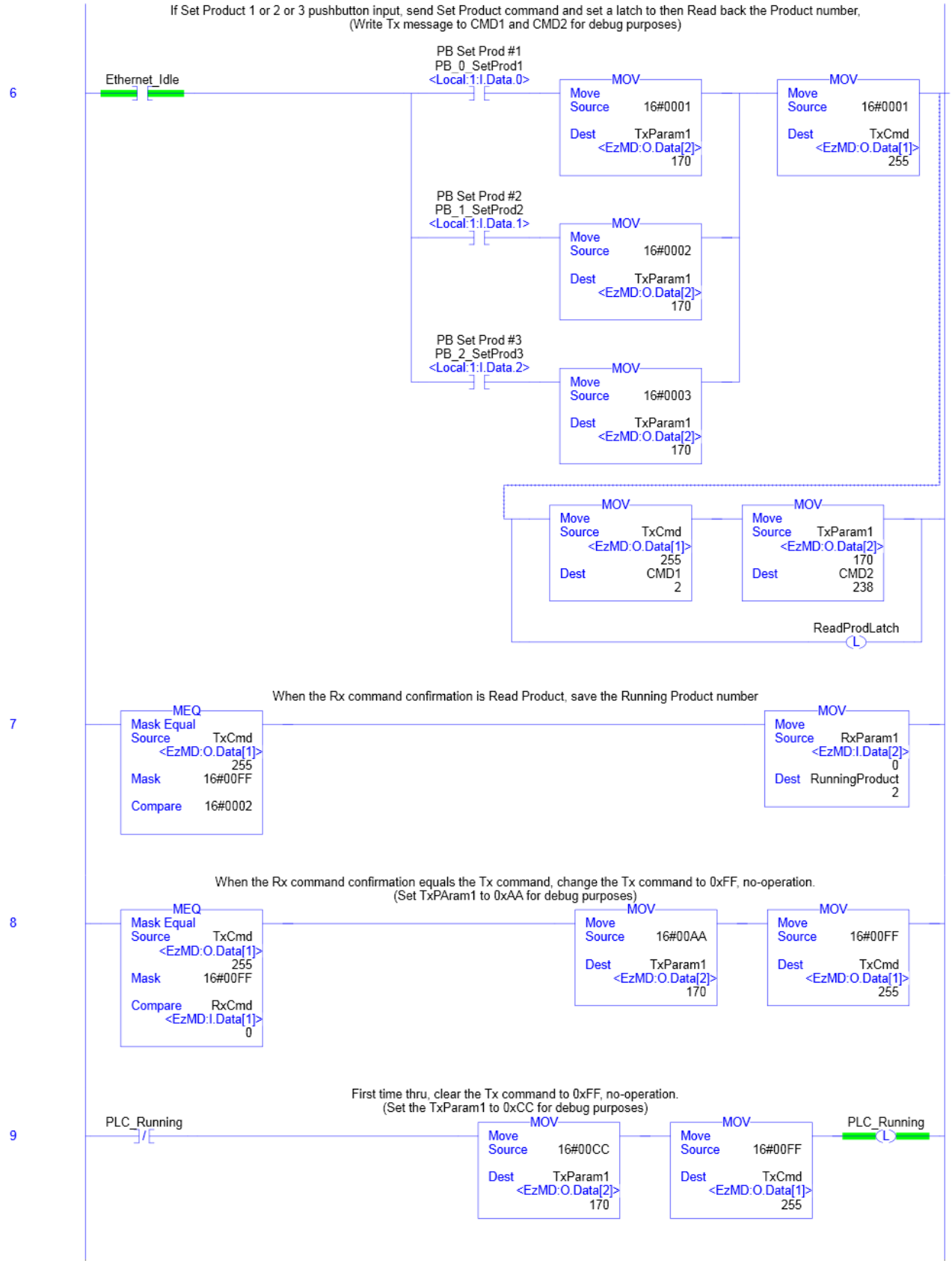
The sample program assumes one generic Ethernet IP module named EzMD, one 16-bit DC input module named Local:1, and one 16-bit DC output module named Local:2.Inputs and outputs assigned below.

The Ladder diagram, tags, and rung descriptions can be found on the pages that follow.



	PLC output **Local:I.Data**		**DC Outputs** **Local:O.Data**
0	SetProduct #1 (momentary 24V)	0	MD Fault
1	SetProduct #2 (momentary 24V)	1	MD Warning
2	SetProduct #3 (momentary 24V)	2	MD Ready
3		3	MD Invalid Command
4	Read Running Product (momentary 24V)	4	
5		5	
6	Select data to display 0V = Display running product 24V = Display heartbeat	6	
7		7	No Reply from MD
8-14		8-14	7-bit Binary display
15		15	Ethernet Idle


0
Continuously write MD status to low byte of output port, with MD status bit 15 in output bit 7 position.
SWPB
Swap Byte
Source RxStatus
<EzMD:I.Data[0]>
4
Order Mode WORD
Dest work1
1024
MVM
Masked Move
Source work1
1024
Mask 16#0080
Dest Local:2:O.Data
2#1000_0010_0000_0100
MVM
Masked Move
Source RxStatus
<EzMD:I.Data[0]>
4
Mask 16#007F
Dest Local:2:O.Data
2#1000_0010_0000_0100
1
When Display Selector (input bit 6) is 24V, continuously copy 7-bit MD heartbeat bits 0-6 to the output port bits 8-14 for binary display.
Display Heartbeat
Select_6_Display
<Local:1:I.Data.6>
MVM
Masked Move
Source RxHeartbeat
<EzMD:I.Data[5]>
2054
Mask 16#7F00
Dest Local:2:O.Data
2#1000_0010_0000_0100
2
When Display Selector (input bit 6) is NOT 24V, continuously copy 7-bit MD Running Product number bits 0-6 to the output port bits 8-14 for binary display.
Display Heartbeat
Select_6_Display
<Local:1:I.Data.6>
SWPB
Swap Byte
Source RunningProduct
2
Order Mode WORD
Dest work2
512
MVM
Masked Move
Source work2
512
Mask 16#7F00
Dest Local:2:O.Data
2#1000_0010_0000_0100
3
Ethernet_Idle
Ethernet Idle
Local:2:O.Data.15
4
If the Tx command is 0xFF and Rx command is 0x00, then turn on Ethernet Idle
MEQ
Mask Equal
Source 16#00FF
Mask 16#00FF
Compare TxCmd
<EzMD:O.Data[1]>
255
MEQ
Mask Equal
Source 16#0000
Mask 16#00FF
Compare RxCmd
<EzMD:I.Data[1]>
0
Ethernet_Idle
5
If Read Product pushbutton input or the Read Product latch is set, then send Read Product command and clear the Read Product latch
(Set the TxParam1 to 0xEE and write Tx message to CMD1 and CMD2 for debug purposes)
Ethernet_Idle
ReadProdLatch
PB Read Prod
PB_4_ReadProd
<Local:1:I.Data.4>
MOV
Move
Source 16#00EE
Dest TxParam1
<EzMD:O.Data[2]>
170
MOV
Move
Source 16#0002
Dest TxCmd
<EzMD:O.Data[1]>
255
MOV
Move
Source TxCmd
<EzMD:O.Data[1]>
255
Dest CMD1
2
MOV
Move
Source TxParam1
<EzMD:O.Data[2]>
170
Dest CMD2
238
ReadProdLatch
U


If Set Product 1 or 2 or 3 pushbutton input, send Set Product command and set a latch to then Read back the Product number,
(Write Tx message to CMD1 and CMD2 for debug purposes)
6
Ethernet_Idle
PB Set Prod #1
PB_0_SetProd1
<Local:1:I.Data.0>
MOV
Move
Source 16#0001
Dest TxParam1
<EzMD:O.Data[2]>
170
MOV
Move
Source 16#0001
Dest TxCmd
<EzMD:O.Data[1]>
255
PB Set Prod #2
PB_1_SetProd2
<Local:1:I.Data.1>
MOV
Move
Source 16#0002
Dest TxParam1
<EzMD:O.Data[2]>
170
PB Set Prod #3
PB_2_SetProd3
<Local:1:I.Data.2>
MOV
Move
Source 16#0003
Dest TxParam1
<EzMD:O.Data[2]>
170
MOV
Move
Source TxCmd
<EzMD:O.Data[1]>
255
Dest CMD1
2
MOV
Move
Source TxParam1
<EzMD:O.Data[2]>
170
Dest CMD2
238
ReadProdLatch
When the Rx command confirmation is Read Product, save the Running Product number
7
MEQ
Mask Equal
Source TxCmd
<EzMD:O.Data[1]>
255
Mask 16#00FF
Compare 16#0002
MOV
Move
Source RxParam1
<EzMD:I.Data[2]>
0
Dest RunningProduct
2
When the Rx command confirmation equals the Tx command, change the Tx command to 0xFF, no-operation.
(Set TxPAram1 to 0xAA for debug purposes)
8
MEQ
Mask Equal
Source TxCmd
<EzMD:O.Data[1]>
255
Mask 16#00FF
Compare RxCmd
<EzMD:I.Data[1]>
0
MOV
Move
Source 16#00AA
Dest TxParam1
<EzMD:O.Data[2]>
170
MOV
Move
Source 16#00FF
Dest TxCmd
<EzMD:O.Data[1]>
255
First time thru, clear the Tx command to 0xFF, no-operation.
(Set the TxParam1 to 0xCC for debug purposes)
9
PLC_Running
MOV
Move
Source 16#00CC
Dest TxParam1
<EzMD:O.Data[2]>
170
MOV
Move
Source 16#00FF
Dest TxCmd
<EzMD:O.Data[1]>
255
PLC_Running

MainRoutine - Routine Tag Listing **Page 1**
Eriez_MD_test_ver_19:MainTask:MainProgram 12/13/2013 12:05:03 PM
C:\Eriez\PLC\Sample1_PLC_Program.ACD

Name	Value	Data Type	Scope
CMD1	2	DINT	MainProgram
Constant	No		
External Access:	Read/Write		
*CMD1 - MainProgram/MainRoutine - *5(MOV), *6(MOV)*			
CMD2	238	DINT	MainProgram
Constant	No		
External Access:	Read/Write		
*CMD2 - MainProgram/MainRoutine - *5(MOV), *6(MOV)*			
Ethernet_Idle	2#1	BOOL	MainProgram
Constant	No		
External Access:	Read/Write		
*Ethernet_Idle - MainProgram/MainRoutine - *4(OTE), 3(XIC), 5(XIC), 6(XIC)*			
Local:2:O		AB:Embedded_OB16:O:0	Eriez_MD_test_ver_19
External Access:	Read/Write		
Local:2:O.Data	2#1000_0010_0000_0100	INT	
*Local:2:O.Data - MainProgram/MainRoutine - *0(MVM), *1(MVM), *2(MVM)*			
Local:2:O.Data.15	1	BOOL	
Ethernet Idle			
*Local:2:O.Data.15 - MainProgram/MainRoutine - *3(OTE)*			
PB_0_SetProd1	2#0	BOOL	MainProgram
PB Set Prod #1			
AliasFor:	Local:1:I.Data.0(C)		
Base Tag:	Local:1:I.Data.0(C)		
Constant	No		
External Access:	Read/Write		
PB_0_SetProd1 - MainProgram/MainRoutine - 6(XIC)			
PB_1_SetProd2	0	BOOL	MainProgram
PB Set Prod #2			
AliasFor:	Local:1:I.Data.1(C)		
Base Tag:	Local:1:I.Data.1(C)		
Constant	No		
External Access:	Read/Write		
PB_1_SetProd2 - MainProgram/MainRoutine - 6(XIC)			
PB_2_SetProd3	2#0	BOOL	MainProgram
PB Set Prod #3			
AliasFor:	Local:1:I.Data.2(C)		
Base Tag:	Local:1:I.Data.2(C)		
Constant	No		
External Access:	Read/Write		
PB_2_SetProd3 - MainProgram/MainRoutine - 6(XIC)			
PB_4_ReadProd	0	BOOL	MainProgram
PB Read Prod			
AliasFor:	Local:1:I.Data.4(C)		
Base Tag:	Local:1:I.Data.4(C)		
Constant	No		
External Access:	Read/Write		
PB_4_ReadProd - MainProgram/MainRoutine - 5(XIC)			
PLC_Running	2#1	BOOL	MainProgram
Constant	No		
External Access:	Read/Write		
*PLC_Running - MainProgram/MainRoutine - *9(OTL), 9(XIO)*			

RSLogix 5000

ReadProdLatch	2#0	BOOL	MainProgram
Constant	No		
External Access:	Read/Write		
*ReadProdLatch - MainProgram/MainRoutine - *5(OTU), *6(OTL), 5(XIC)*			
RunningProduct	2	INT	MainProgram
Constant	No		
External Access:	Read/Write		
*RunningProduct - MainProgram/MainRoutine - *7(MOV), 2(SWPB)*			
RxCmd	0	INT	MainProgram
AliasFor:	EzMD:I.Data[1](C)		
Base Tag:	EzMD:I.Data[1](C)		
Constant	No		
External Access:	Read/Write		
RxCmd - MainProgram/MainRoutine - 4(MEQ), 8(MEQ)			
RxHeartbeat	2054	INT	MainProgram
AliasFor:	EzMD:I.Data[5](C)		
Base Tag:	EzMD:I.Data[5](C)		
Constant	No		
External Access:	Read/Write		
RxHeartbeat - MainProgram/MainRoutine - 1(MVM)			
RxParam1	0	INT	MainProgram
AliasFor:	EzMD:I.Data[2](C)		
Base Tag:	EzMD:I.Data[2](C)		
Constant	No		
External Access:	Read/Write		
RxParam1 - MainProgram/MainRoutine - 7(MOV)			
RxStatus	4	INT	MainProgram
AliasFor:	EzMD:I.Data[0](C)		
Base Tag:	EzMD:I.Data[0](C)		
Constant	No		
External Access:	Read/Write		
RxStatus - MainProgram/MainRoutine - 0(MVM), 0(SWPB)			
Select_6_Display	2#0	BOOL	MainProgram
Display Heartbeat			
AliasFor:	Local:1:I.Data.6(C)		
Base Tag:	Local:1:I.Data.6(C)		
Constant	No		
External Access:	Read/Write		
Select_6_Display - MainProgram/MainRoutine - 1(XIC), 2(XIO)			
TxCmd	255	INT	MainProgram
AliasFor:	EzMD:O.Data[1](C)		
Base Tag:	EzMD:O.Data[1](C)		
Constant	No		
External Access:	Read/Write		
*TxCmd - MainProgram/MainRoutine - *5(MOV), *6(MOV), *8(MOV), *9(MOV), 4(MEQ), 5(MOV), 6(MOV), 7(MEQ), 8(MEQ)*			
TxParam1	170	INT	MainProgram
AliasFor:	EzMD:O.Data[2](C)		
Base Tag:	EzMD:O.Data[2](C)		
Constant	No		
External Access:	Read/Write		
*TxParam1 - MainProgram/MainRoutine - *5(MOV), *6(MOV), *8(MOV), *9(MOV), 5(MOV), 6(MOV)*			
work1	1024	INT	MainProgram

work1 (Continued)
swap status
Constant No
External Access: Read/Write
*work1 - MainProgram/MainRoutine - *0(SWPB), 0(MVM)*

work2	512	INT	MainProgram

swap prod number
Constant No
External Access: Read/Write
*work2 - MainProgram/MainRoutine - *2(SWPB), 2(MVM)*

MAINTENANCE

INTRODUCTION

No periodic maintenance or adjustment of the metal detector is required. A verification check at the beginning of every shift is recommended.

TROUBLESHOOTING

If metal detector false tripping occurs, refer to the information in the Installation sections of this manual. For further assistance, please contact the factory. In the event of equipment damage or malfunction, contact the factory for troubleshooting steps, and to obtain spare parts.

CAUTION

To avoid injury or damage to the equipment, all electrical maintenance on the metal detector is to be performed by qualified service technicians authorised by Eriez Manufacturing Company.

WARNING – HAZARDOUS VOLTAGE

Hazardous voltages are present in this equipment when energised. All power sources must be isolated or disconnected before accessing the inside of the enclosure.

CAUTION

A double pole breaker is to be installed between the metal detector and the power source to allow for the metal detector to be completely disconnected from the power source during installation and maintenance. All lock-out tag-out procedures and local safety codes are to be followed during metal detector maintenance.

After any service is performed, verify that all protective earth connections are re-attached, and the enclosure cover is re-installed, before restoring power to the equipment.

CAUTION

For continued compliance with electrical safety standards, the protective earth connection from the power source must be connected directly to the protective terminal on the wall of the enclosure. This is required to be the FIRST connection to the terminal, and secured with a star lock washer and nut, independent of any other connections to the terminal.

CLEANING

For proper metal detector operation, the following cleaning requirements must be met:

1. Material must not be allowed to fill the gap between the aperture and the conveyor slider bed.
2. The aperture and conveyor should be free of contamination (especially metal).

Additional cleaning may be needed, based on the sanitary requirements/good manufacturing practices of the customer's production environment.

The metal detector may be cleaned by wipe-down, compressed air, low-pressure washdown, or high-pressure washdown, as desired. If liquids will be used for cleaning, ensure external USB and/or Ethernet connectors are capped, or connected to appropriate IP rated cables. If high-pressure water will be used, ensure the washdown cover is in place over the display, to avoid damage or unintended actuation of the touch screen.

All cleaning procedures must be conducted when the unit is powered down. If, for any reason, cleaning must be conducted when the equipment is powered, ensure that personnel and equipment are always clear from the path of any reject devices to avoid any unsafe conditions.

CAUTION

Cleaning procedures may cause false trips of the metal detector, resulting in actuation of any connected reject devices. Ensure personnel and equipment are always clear from the path of the reject devices. To avoid an unsafe condition or damage to equipment, remove all power sources (including air supplies) from the metal detector and reject devices prior to high-pressure washdown. **Note: Vertical and Web Line Metal Detectors are not rated for high pressure washdown.**

CAUTION

When cleaning the metal detector surfaces, use appropriate personal protective equipment (PPE) for any physical/chemical/biological hazards that may exist due to the end user's production environment. Avoid contact with contaminants on or around the metal detector. Pressure wash and sanitise metal detector surfaces when maintenance is required.
Note: Vertical and Web Line Metal Detectors are not rated for high pressure washdown.

OPERATING SYSTEM

You may order a copy of the operating system source code for your metal detector. Please provide a written request including your name, company, address, e-mail address, and serial number of the metal detector to the following:

Eriez Manufacturing Co.
ATTN: Legal Department - Intellectual Property Counsel
2200 Asbury Road
Erie, PA 16506

Please note that Eriez may charge a fee to cover the cost of performing this distribution.

DISPOSAL

The equipment should be disposed according to local regulations. Dispose of the components in compliance with all applicable regulations. Contact your local waste and recycling management authority for more information.

ERIEZ

HEADQUARTERS
2200 Asbury Road • Erie, PA 16506-1402 U.S.A. • +1-814-835-6000 • eriez@eriez.com • www.eriez.com

Manufacturing Facilities: AUSTRALIA • BRAZIL • CANADA • CHILE • CHINA • GERMANY • INDIA • JAPAN • MEXICO • PERU • SOUTH AFRICA • UNITED KINGDOM • UNITED STATES

ERIEZ-MDM-220-IOM-107P-052026